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In Plain English

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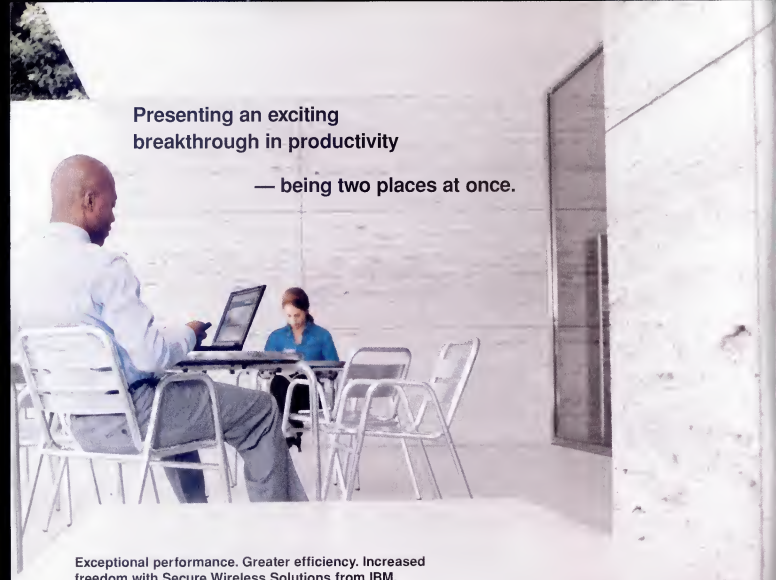

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Software license agreements may apply. †Includes battery and optional travel board instead of standard optical drive in UltraBay bay if applicable; weight may vary due to vendor components, manufacturing process and options. †Innross may vary at certain points on the system. **Telephone support may be subject to additional charges. For onsite labor, IBM will attempt to diagnose and resolve the problem remotely before sending a technician. Certain Microsoft software product(s) included with this computer may use technological measures for copy protection. IN SUCH EVENT, YOU WILL NOT BE ABLE TO USE THE PRODUCT. YOU DO NOT HAVE TO COMPLY WITH THE PRODUCT ACTIVATION PROCEDURES. Product activation procedures and Microsoft's privacy policy will be detailed during initial launch of the product or upon certain reinstallations of the software product(s) or reconfigurations of the computer and may be completed by Internet or telephone (toll charges may apply). ††These model numbers achieved a Battery Eater, Inc.'s BatteryMark 4.01 Battery Punchdown Time of at least the times shown above. This test was performed without independent verification by eTesting Labs, Inc. eTesting Labs, Inc. makes no representations or warranties as to these test results. BatteryMark is a trademark of Jeff Dean. Participating Holdings Inc. is an affiliate of eTesting Labs, Inc. in the U.S. and other countries. A description of the environment under which the test was performed is available at .com.com/pcc/view/filevault/batterylife.html. These services are available for machines normally used for business professional or trade purposes rather than personal family or household purposes. Not all machine types and models are covered. Service period begins with the equipment date of purchase. Service must be purchased during the original limited product warranty period. Service levels are response-time objectives and are not guarantees. A service technician is scheduled to arrive at your location within two or four business hours or the next business day (depending on service) after remote problem determination is completed. For the 9x5/4 hour service, calls dispatched after 1:00 p.m. local time you can expect the service technician to arrive by the morning of the next business day. For noncritical service requests, a service technician will arrive by the end of the following business day if the machine problem turns out to be a Customer Replaceable Unit (CRU). IBM will express ship the part to you for quick replacement. Onsite 24x7x2-hour service is not available in all locations. External peripherals such as racks, tape drives and channel extenders require their own separate service coverage. Any are not covered under the attached Machine. Service activation is required immediately following purchase. For ThinkPad notebooks requiring LCD or other component replacement, IBM may choose to perform service at the depot repair center. For failing non IBM components customer must provide replacement part unless IBM has a Technical Support Agreement with the manufacturer. Service does not cover accessories, supply items and certain parts such as batteries. Innross and covers. With Intel SpeedStep, processor speed may be reduced to conserve battery power. *Requires Internet access account, not included. †Based on IEEE 802.11b. This wireless LAN product has been designed to permit legal operation worldwide in regions in which it is approved. Operation on channels 12-14 is not permitted in all regulatory regions in the world. Consequently the wireless LAN hardware is limited to operation on channels 1-11 and will not support channels 12-13 and 14. This product has been tested and is certified to be interoperable by the Wireless Ethernet Compatibility Alliance and is authorized to carry the Wi-Fi logo. †IBM does not manufacture, warrant or support this product. IBM logos and trademarks used under license. Contact IBM for details. *Requires compatible wireless-enabled option sold separately. †††ThinkPad X Series will not have antenna route and frame of display. All offers subject to availability. IBM reserves the right to alter product offerings and specifications at any time, without notice. IBM is not responsible for photographic or typographic errors. All IBM product names are registered trademarks or trademarks of International Business Machines Corporation in the U.S. and other countries. Lotus and SmartSuite are registered trademarks of Lotus Development Corporation an IBM Company. 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Focus On: Digital Photography

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According to IDC analyst Chris Chute, more than 9 million digital cameras were sold in 2002. With all of those people snapping digital images, we put together a primer on digital photography: cameras, printers, storage options, and photo-editing software.

61 Picture Perfect

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Editor's Note

In the summer of 1827, Joseph Niépce, a French researcher working in England, created the first true photograph. Since then, photography has become a popular and absorbing blend of art and science: Optics, chemistry, and engineering combine with aesthetics and design to create an exciting fusion of ideas that has fascinated us for 175 years.

And now we can add computers and electronics to the compelling mix of photographic technologies that lets us exercise our creativity, chronicle our world, and share our lives.

Sales of digital cameras are booming: According to InfoTrends Research Group, North American sales of low-end (sub-$1,000) digital cameras were 9.5M units in 2002, and should reach 11.6M in 2003. It's easy to see why. For less than $100, you can buy a decent digital point-and-shoot, and if you're willing to spend more you can now purchase digicams that are beginning to approach film quality. If you need to acquire images to email or post on a Web site, the purchase of a digicam is a no-brainer. If you want to display professional-quality prints, you'll need to spend some extra bucks, but even high-performance digital photography is more affordable now than ever before.

Whether you're after quick snaps of the kids to send to Grandma or hi-res photos for that brochure you're putting together, digital photography isn't something you want to jump into without a little background. Even experienced photographers have found themselves befuddled by the new technology and by the many camera and image-editing options that are suddenly available.

But we'll help you out with that. This month's issue of *Smart Computing* will tell you how these cameras work, what you should look for if you're in the market, and how to get the most out of a digicam. In addition, we'll compare three of the most popular (and affordable) photo-editing suites, and tell you which one we think outscored the others.

Who knows? Maybe with a little background info, some talent, and some hard work, you'll be the one to create that next prize-winning photo. Don't forget to thank the *Smart Computing* team when you give your acceptance speech. Or at least wave the mag around on your way up to the podium.

Rod Scher, Publication Editor

Now Available On Newsstands . . .

Computer Power User • Windows vs. Linux vs. Apple

Win XP, SuSE, and Apple's Jaguar go head to head; which OS is best for your needs? We walk you down the path to evaluation. This month we'll also give you a better understanding of flat-panel screens, spam killers, and a whole lot more.

Learning Series • Windows 98/Me

This month in the *Smart Computing Learning Series* we help Windows 98 and Windows Me users get to the root of all sorts of nagging problems with their PCs. Tired of getting the same cryptic error message every time you reboot? Sick of fighting with a recalcitrant printer? We'll help you figure out what's wrong and show you how to fix these and many other problems.

Reference Series • Working With PC Files

Newly updated, this reprint of our popular *Reference Series* issue explains just about everything you need to know about files: what various file types are for, how to transfer data from one medium to another, how to update data from one application version to another, how to compress and decompress data, how to recover corrupted files, etc.

Corrections/Clarifications

In our January issue we ran an article ("I Burn The Songs") about how to create audio discs in which we mistakenly ran (pg. 60) a picture of a Nero Burning ROM wizard with an Easy CD Creator caption.

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Wireless Internet Access Goes Nationwide

Nowadays, it doesn't take a network administrator or a similarly inclined techie to build a wireless network. Home users are picking up on how easy it is to put together a wireless LAN (local-area network) with routers, access points, and wireless LAN cards that use the 802.11b standard (popularly known as Wi-Fi) for sending data from one PC to another over the airwaves. In fact, companies such as Belkin, Buslink, and D-Link offer reasonably priced kits that help new users get started with little effort. The highly popular computer company Gateway also recently began offering a Wireless Connectivity bundle for $99 after rebates with the purchase of a cable broadband subscription.

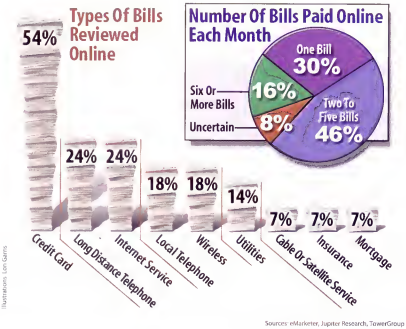
Road warriors have already caught on to the wireless trend, having figured out ways to adapt notebooks and wireless gear to tap into open, nonsecure wireless networks for quick, free Internet access. And folks in neighborhoods and apartment buildings are learning that it's easy to cut out the expense of paying multiple ISP (Internet service provider) bills by letting one household hook up a cable modem, subscribe to Internet access through a local ISP, install a wireless access point, and let neighboring households in on the action. So how is an ISP to combat such a trend? Powerhouse companies AT&T, IBM, and Intel have begun to answer that question by combining forces and forming a new company, Cometa Networks.

Rather than selling wireless access directly to consumers, Cometa Networks will sell wholesale wireless broadband Internet access to ISPs and cable operators nationwide. The ISPs and cable operators will then sell the access to their customers.

At press time, the involved companies weren't elaborating on Cometa Networks' plans, and Cometa Networks spokesperson Steve Harris said that the new company was busy working on deployment issues. But according to a press release posted on the AT&T (http://www.att.com), IBM (http://www.ibm.com), and Intel (http://www.intel.com) Web sites, in addition to the newly available Cometa Networks site (http://www.cometanetworks.com), access should be available to 50 metropolitan areas in the United States sometime in 2003. The new services won't require that end users adopt new email addresses or passwords.

Online Bill Payment Is On The Rise

According to recent surveys, roughly 20% of U.S. households currently view bills online, up from 2% in 1998. The trend doesn't seem to be waning, either, with Jupiter Research predicting that 50% will view bills online in 2006. Here's a look at the number of bills U.S. households are paying each month via the Internet and what types of bills U.S. consumers are reviewing online.



IBM Creates The Latest Microscopic Transistor

It's difficult enough to comprehend the size of a micron, which is one millionth of a meter, or about one-fiftieth the width of a human hair. But it's almost impossible to imagine the size of a nanometer, which equals 1 billionth of a meter. Nevertheless, microchip manufacturers commonly create processors and other chips with transistors that are only a handful of nanometers wide. Transistors, with the ability to be either "on" or "off," create the 1s and 0s that make up digital data. The microchips you find in most computers today usually have transistors that are at least 60nm wide.

AMD (Advanced Micro Devices, maker of Athlon processors) recently announced that it had developed a 10nm transistor. However, the Consortium of International Semiconductor Companies claims that transistors must be smaller than 9nm if the constantly increasing microchip performance trend is to continue beyond the year 2016. IBM researchers have already made a huge step (or rather, a tiny step) in that direction by building the world's first 6nm transistor. Although we won't be seeing these transistors on the market anytime soon, the new technology brings the semiconductor industry a step closer to making microchips that are dozens of times smaller than those available today.

Viruses Proliferate Now More Than Ever

For those of you who know that it's a good idea to have firewall and antivirus programs for your home or home office computer but haven't gotten around to buying and installing them, MessageLabs has a message for you. MessageLabs, an email security service provider based in the United Kingdom, recently reported that out of all the email messages it processed in 2002, one in every 212 contained a virus. Although this statistic is frightening enough, it's even more dramatic when you compare it to the figure for 2001, when one in every 380 messages contained a virus.

MessageLabs reported that it found 237 new viruses in 2002 and expects the number to climb every year. Klez was the top virus for the year; in November 2002, at the height of Klez's proliferation, MessageLabs reportedly intercepted 423,000 copies of the virus. The Bugbear virus was first runner-up with more than 800,000 copies intercepted in September through November 2002, and the notorious Nimda took 10th place. MessageLabs and other Internet security experts claim home users and small businesses help spread viruses more quickly than big businesses, which often have powerful firewalls.

REVIEW

Clean Up Your Hard Drive

When your hard drive is new, your computer saves clumps of data next to each other in portions of the hard drive called sectors. Over time, as you delete and undelete files and install and uninstall programs, data becomes scattered. Additionally, as your hard drive ages, some of its sectors can become damaged. After extensive use (saving and resaving files), your hard drive may be badly fragmented.

Windows has two utilities that can help: ScanDisk looks for and corrects hard drive errors, and Disk Defragmenter puts scattered data back in order. You can run these utilities yourself or buy a program, such as PC Mesh's Defrag For Windows 1.0, to do the job. You can pay $19 for a full version of Defrag For Windows or download a free trial version first. With Defrag For Windows, you can choose whether you want the program to run ScanDisk or consolidate the Windows page file (which lets Windows use part of your hard drive for memory) before defragmenting. Running ScanDisk is a good idea, but it's not necessary to consolidate or disable the page file. Defrag For Windows also lets you choose whether you want it to restart, shut down, or leave your computer alone after defragmenting. After selecting the options you want, click OK and the program does the rest.

This program might sound good, but there's no need to spend a single dollar (let alone $19) on Defrag For Windows. You can easily run the ScanDisk and Disk Defragmenter utilities on your own. If you're using Windows 95/98/98SE/NT/2000/Me, run ScanDisk first by clicking Start, Programs, System Tools, and ScanDisk. Select the appropriate drive (usually C:), click the Thorough radio button, the Automatically Fix Errors checkbox, and Start. When complete, run Disk Defragmenter by clicking Start, Programs, System Tools, and Disk Defragmenter. If you're using Windows XP click Start, All Programs, System Tools, and Disk Defragmenter. Click Analyze and afterward, if necessary, click Disk Defragment.

Defrag For Windows 1.0

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Media Center Computers Have Arrived

If you haven't already heard the buzz about so-called "media center" PCs, you soon will. Numerous manufacturers have released home computers that double as media centers, which are essentially desktop systems optimized with the components and software necessary for playing high-quality audio, video, and PC games and integrating easily into existing home theater systems. Users willing to pay thousands of dollars for high-performance systems know that computers with these kinds of capabilities are nothing new. But what is new is that Microsoft is backing the media center trend with a special version of Windows XP called (what else?) Windows XP Media Center Edition.

WinXP MCE has all the same features you'll find in WinXP, but it looks and acts like a cross between WinXP and Microsoft's Windows Media Player. You can, for example, use WinXP MCE to complete any task you might undertake on an ordinary desktop PC (such as composing Word documents and Excel spreadsheets), but you can also use it to surf the Internet, play prerecorded a TV show, view a DVD movie, or listen to music saved to your computer's hard drive all via remote control from the comfort of your living room couch.

You can't purchase WinXP MCE on Microsoft's shopping site in the same way you could purchase, say, WinXP Home Edition, mainly because WinXP MCE has a set of system requirements that the average home computer isn't likely to meet. Requirements include a video card with a TV tuner (or a video card and separate TV tuner), digital audio output, a WinXP MCE-compatible remote control, and an infrared port (the same kind found on most TV sets).

Whether multimedia-hungry WinXP users will take to WinXP MCE remains to be seen, but the push is on with computer manufacturers, such as Alienware, Gateway, Hewlett-Packard, and Samsung, all weighing in with WinXP MCE systems. By the time you read this, the HP Media Center PC lineup is scheduled to be available in more than 1,400 outlets throughout North America with price tags starting at $1,399.

REVIEW

Expand Your USB Horizons

First you buy a notebook computer so you can take your documents, digital photos, presentations, slideshows, or some combination thereof on the road. Being a newer model, the notebook has two USB (Universal Serial Bus) 2.0 ports, which is fine at first. But before you know it, you have three or more portable USB devices (say, a digital camera, a CD-RW [CD-rewriteable] drive, and a mouse) that you want to run at the same time. This is where a little hub, such as Adaptec's XHub For Notebooks, comes into play.

The XHub For Notebooks plugs into a USB port on your notebook (or, if you prefer, on your desktop system) and provides you with four additional USB ports. Voila, problem solved. But what's this about USB 2.0? The original USB standard, USB 1.1, operates at speeds as fast as12Mbps (megabits per second). This is pretty slow, but it's fine for low-power devices such as mice. The newer USB standard, USB 2.0, transfers data at speeds as fast as 480Mbps. If you have USB 2.0 devices, you can take advantage of the faster speed. However, to use USB 2.0, your computer must support it. Take a look at the USB ports; if you see a plus sign (+) next to the USB logo, those ports support the USB 2.0 standard. Otherwise, whatever USB device you plug into that port (whether it uses USB 1.1 or USB 2.0) will transfer data at the slower USB 1.1 speed.

The XHub For Notebooks worked perfectly in our tests, and its $39.99 price tag matches the competition. It comes with lights that indicate what ports are in use, a printed Quick Start Guide, and a CD containing device drivers and a USB management utility. The XHub For Notebooks works with Windows 98SE/2000 /Me/XP and Mac OS 9.4 or later.

XHub For Notebooks

Adaptec
(408) 945-8600
http://www.adaptec.com

Duly Quoted

"There's something just plain wrong about a city where you can find 100 open wireless networks in a half hour and not one public bathroom."

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Nathan Chandler

Send insights and insults to Nathan at nathan@smartcomputing.com

A More Complete Coolpix

Nikon Delivers With Its Advanced 5700

Every digicam has limitations, a fact no one knows better than an amateur photographer who gets fed up with the inadequate features on a simple point-and-shoot camera. When that frustration sets in, it may be time to upgrade to a so-called prosumer model, a category of cameras aimed at near-pro photographers but with consumer-grade prices.

Because I'd outgrown my little 2-megapixel camera, I opted to try out the Nikon Coolpix 5700, an expensive model with a 5-megapixel sensor and a full slate of manual controls. I learned a few things using this camera. One is that although this camera has a nice Auto mode, its manual controls will offer novices a steep learning curve. Also, I learned that although a more expensive camera may give you broader picture-taking abilities, you'll have to deal with a new set of potential problems.

Coolpix 5700

Big Differences

The most noticeable specs on the 5700 are the 5-megapixel sensor and the 8X optical zoom power, which is almost three times the power of average digicams. Partly due to this zoom, the 5700 needs about four seconds to start up and ready itself for shooting.

Once I did begin taking pictures, shot-to-shot times were about two seconds. When using the higher resolutions and the flash, however, the 5700 slowed down. Taking multiple high-res images in succession sometimes caused the camera to momentarily freeze.

Another notable aspect of the 5700 was the color monitor, which folds out and twists up and down to help you better frame awkward shots. Although bright and clear, the monitor was too small (only 1.5 inches across) and nearly impossible to view at an angle. The only alternative was to use the EVF (electronic viewfinder). I don't mind EVFs, but those who use optical viewfinders to conserve battery power won't be happy.

The 5700 drains power with fervor. The rechargeable lithium-ion battery will fade after less than two hours of continuous use, meaning both casual users and pros will need one, if not two, extras (costing at least $30 each) to ensure they'll have power when they need it.

Controls & Image Quality

You'll definitely need the extra power (and time) when you're learning this Nikon's manual controls. The booklet explains these controls, but changing some settings requires that you press buttons and spin a command wheel simultaneously. It doesn't take long to learn, but the control system, which seems cramped on the camera's small case, can be hard to use, especially for those with less-than-agile fingers.

A bigger problem I noticed was the omission of an autofocus-assist lamp. Nikon generally eschews this feature in its cameras, but I could have used one: In average to low light, the autofocus often zoomed in and out in vain, unable to lock onto a subject without extra illumination.

When I did manage to snag shots, I found that the 5700 put its 5 megapixels to good use. This camera captured incredible detail, and thanks to the long zoom lens, it can do so from a distance. In my tests, image quality was very good, with almost none of the color problems I've seen in sub-$500 cameras. I saw little distortion at either the telephoto or wide-angle lens position.

The Big Picture

There's no doubt that the 5700 will do much to increase the range of creativity and control for advanced amateurs. In addition to more manual controls, you have the option to add additional lenses and a bigger flash via the hot shoe.

Thus, the tremendous flexibility this camera offers will please anyone looking to improve his photography skills. It's an expensive product, though, and you won't want to overlook that you'll need an extra battery or two, a case, and a sizeable (at least 256MB) CompactFlash card to store those high-resolution images. ■

For More Information

Coolpix 5700
$1,200
Nikon
(800) 645-6689
http://www.nikonusa.com

Cal Clinchard

Send your comments to cal@smartcomputing.com

DVD Video In The Palm Of Your Hand

Hitachi's DZ-MV200A Brings DVD Quality To The Portable Video Camera

If you're a fan of DVD technology but you're still using a VHS or Hi8 video camera to take home movies, you might've noticed with interest recent ads for DVD digital camcorders. I can relate. Having a Sony Hi8 camcorder and video-editing experience as reference points, I located a Hitachi DZ-MV200A DVD-RAM/R camcorder and spent some time creating homemade mini (8cm) DVDs.

DZ-MV200A

Wade Into The Paper

When I opened the box, the first thing I noticed was an 8.5-inch x 11-inch 114-page manual. This concerned me more than a little, as I'm no fan of having to read a book before I can start having fun with a new electronic gadget. Then I removed the camcorder itself from the box and saw some familiar sights. The DZ-MV200A looks like a typical Hi8 camcorder in most respects; it's the same size and has a tilting viewfinder, a pop-out 2.5-inch LCD (liquid-crystal display) view screen on the left, an eject button on the back, a removable Li-Ion (lithium-ion) battery, a zoom lever with telephoto and wide-angle features, a power switch, and a record button.

With no awards for patience hanging in the balance, I temporarily chucked the manual and picked up a mini DVD-RAM (which, like a full-sized DVD-RAM, comes in cartridge format so you don't actually see the disc inside). I turned on the DZ-MV200A, pressed the Eject button, popped in the mini DVD-RAM, removed the lens cap, and pressed the Record button. To my delight, the camcorder began working exactly as my Hi8 Sony model works. The battery was running low, so I plugged it in for a charge. It took the better part of an hour to charge completely, and in that time, I sat down with the manual, which is packed with clear, illustrated tutorials and contains a thorough index and a troubleshooting section.

Organize Your Cinematic Vision

A mini DVD-RAM has a two-sided disc that holds 30 minutes of MPEG-2 (Motion Picture Experts Group-2, or DVD-quality) video on each side. After shooting 30 minutes of video, I followed the instructions for removing the disc to flip it over. I won't get into the details, but it involves sliding two clips with the tip of a fine-point pen, and I managed to break both the clips with little effort. Fortunately, the DVD-RAM still worked. I recorded some more and afterward discovered that the camcorder's Disc Navigation button and minijoystick make finding and deleting scenes (represented by a thumbnail on the LCD screen) an easy task.

I also recorded to a mini DVD-R (DVD-recordable), a miniature version of the familiar full-sized DVD-R (which looks like a standard DVD you'd rent from Hollywood Video). In all, the DZ-MV200A's fully charged battery lasted for about two hours and 20 minutes' worth of recording and playback before dying. I recharged the battery and finalized the mini DVD-R within the camcorder; this took roughly five minutes.

Coming Soon To A Home Theater Near You

My finished DVD-R played well in both a computer DVD-ROM drive and a standalone DVD player. The quality rivaled the best analog video recording; don't expect a cinema-quality picture just because it's on DVD. With DVD, though, you won't have to rewind or worry about tape wearing out. The package includes batteries, a remote control, cables for TV playback, a Mini-USB port, and more. It doesn't, however, include a USB (Universal Serial Bus) cable for connecting the device to a computer. The DZ-MV200A sports more features than I can list here, such as sharp still photography (I tried it with beautiful results) and Dolby Digital stereo sound, so check out the spec sheet on Hitachi's Web site.

For More Information

DZ-MV200A
$999
Hitachi
(800) 448-2244
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http://www.hitachi.com

Dana Montey

Send Dana your opinions at dana@smartcomputing.com

Affordable Real Estate

WinBook's C1900 Is An LCD Worth Considering

When you're looking at a new computer, you're interested in hard drive space, memory, and processor speed. An LCD (liquid-crystal display) would be nice, but not worth the extra dough. But once your system is set up and you realize how much space a CRT (cathode-ray tube) monitor requires, you start to pine for an LCD. Keep reading to find out about WinBook's 19-inch C1900 LCD, which offers lots of visual real estate but takes up little space.

C1900

Technicalities

Weighing 22 pounds, the C1900 has a native resolution of 1,280 x 1,024. The pixel pitch, which is the distance between two pixels of the same color, also contributes to picture quality, and the C1900 has a pixel pitch of 0.294mm. This short distance between pixels means clean images with sharp definition.

The C1900 has a maximum refresh rate of 75Hz, meaning the monitor "rewrites" the screen, from left to right, 75 times per second. If you set the refresh rate much lower than 75Hz, you may see flickering, which causes eyestrain and headaches. The C1900 also lets you adjust the height and the tilt side to side and up and down to ensure you're comfortable looking at the screen.

The C1900's OSD (on-screen display) includes controls for such things as contrast, brightness, horizontal position, vertical position, power save, and display mode. The C1900 also has an Auto function that automatically shifts the LCD's settings to the ones that provide the best picture.

Put To The Test

I tested the C1900 on a machine with an ATI All-In-Wonder Radeon 8500 graphics card, running Windows XP Home. I used the DisplayMate Multimedia Edition diagnostic software and took the monitor through the obstacle course. I also viewed images with Adobe Photoshop and documents with Microsoft Word and Excel; later, I hooked the monitor up to a TV tuner.

The monitor came through the obstacle course with mixed results. The C1900 received perfect scores on some of the tests, including Screen Uniformity, but when it came to some of the other tests, the C1900's performance was merely average. For example, during the Video Bandwidth Brightness Test, which involves viewing thin white lines on a black background and thin black lines on a white background, the C1900 produced lines that looked gray instead of sharp black or white. Another problem was lines running across the screen. I adjusted the refresh rate to try and eliminate the lines, but that didn't help.

The C1900 displayed colors well, but they weren't vibrant. Images viewed in Photoshop looked realistic and shadows were displayed correctly, but the colors were dull. The display quality on documents was decent, but larger fonts were a little fuzzy. When hooked up to the TV tuner, the picture quality was fine, and the monitor was responsive when flipping through the channels.

Home Sweet Home

With the lab tests out of the way, I packed up the C1900 and took it home. The extra 4 inches were an amazing improvement over my 15-inch LCD. I did everything with the C1900: I played games, surfed the Internet, edited digital video, and viewed pictures. I even used the monitor when writing this column. Throughout it all, the problems encountered during lab testing didn't crop up. My only complaint is that the display was too bright at times, and adjusting the brightness didn't help. Still, I really enjoyed the C1900 and wouldn't mind keeping it and returning my 15-inch LCD in its place.

With LCD prices decreasing, you can get a lot for your money, not to mention more desk space for your other gadgets. If you haven't already started thinking about an LCD, now is a good time, and the C1900 is a good place to start.

For More Information

C1900
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$699
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Joshua Gulick

Send your comments to joshua@smartcomputing.com

Better Than Paper

Toss Your Legal Pad & Pick Up A Tablet PC

Despite a market laden with super-slim notebook computers and PDAs (personal digital assistants) that run faster and do more than my first computer even dreamed about, I still jot down notes on a legal pad. I know I'm not the only one who is looking for a computer that can double as an electronic notepad. Several manufacturers claim to have new products that fill the bill—tablet PCs. I ordered one and took out my pen.

More Than A Notepad

As it turns out, Motion Computing's M1200 only recognizes the included Active Digitizer Pen, which looks like an oversized stylus. When you aren't writing, you can use the pen as a mouse; tap once to click, tap twice to double-click, and hold the tip of the stylus against the screen for a second to right-click. The 12.1-inch screen takes up most of the M1200. A directional button and several shortcut buttons (similar to the buttons on PDAs) line one edge of the tablet PC.

M1200

Although the M1200 looks like a large PDA, it is a computer, if not a very powerful one. You can select from several custom packages. The base package will include a free desktop stand and USB (Universal Serial Bus) keyboard through the first quarter of 2003. It comes complete with an Intel Mobile Pentium III-M 866MHz processor, as much as 1GB of RAM, and a hard drive with a capacity as large as to 60GB. It has the same external ports you can find on many desktop PCs, such as USB ports and Ethernet and modem ports. The M1200 also packs the popular Wi-Fi capability, which is a wireless networking standard also known as 802.11b. If you have a wireless network and Internet connection in your house, you can kick back on the couch and surf the Internet with your M1200 tablet PC.

The Windows XP Tablet PC Edition operating system offers two methods of entering information through the stylus: the on-screen keyboard and the Writing Pad. You can access either by tapping the small keyboard icon to the right of the Start button. To enter text, you can write full sentences on the two lines in the Writing Pad window. If you pause for a second or start writing on the next line, the Pad translates your handwriting and displays it in your document as text. The Pad accurately translated my notably poor handwriting as fast as I wrote.

A New Kind Of Journal

I like the Microsoft Windows Journal application. It looks like a ruled notepad and lets you quickly jot down notes in your own handwriting and save them just as you would save a text file. And here's a feature that no legal pad can boast: Journal lets you insert extra lines into your writing. If you fill a page, you can open additional space anywhere in the text to add your note, instead of scribbling the note on the side. It is the equivalent of a hard return in a text document. You can also send your notes as email or let Journal translate the notes to text.

The M1200 makes a great electronic notepad (I especially like being able to rest my palm on the screen without confusing the stylus), but its lack of power makes it a computer you might buy in addition to your desktop PC, rather than to replace it. And if you insist on having a keyboard with you when you travel, you might be better off with a notebook. The M1200 accepts USB keyboards (and Motion Computing sells a travel-sized one on its Web site for $49.99), but the extra keyboard doubles the number of items you have to carry. On the other hand, if you're sick of typing page after page of handwritten notes, the M1200 is the way to go. The $2,000 price tag may seem high (the same price will get you much more power in a notebook), but use the M1200 once and you'll never take notes on paper again.

For More Information

M1200
$2,099 (Base unit)
Motion Computing
(866) 682-2538
(512) 637-1137
http://www.motioncomputing.com

Digital fun made easy!

www.gateway.com/digitalzone/music

Digital music solutions

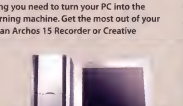
The Gateway 500s Music PC featuring the Intel® Pentium® 4 processor was designed with digital music in mind. With storage for over 1800 CDs of encoded music, it includes everything you need to turn your PC into the ultimate ripping, mixing and CD-burning machine. Get the most out of your digital music experience by adding an Archos 15 Recorder or Creative NOMAD MuVo (shown below).[1]

$1199

or as low as $34 per month for 48 months at 14.9% APR[2]

Gateway 500s Music PC

- Intel® Pentium® 4 Processor 2.00GHz
- 256MB DDR SDRAM
- 60GB 7200 RPM Hard Drive
- 40GB Music Vault Drive with 2000 songs and 90 days pressplay Service[3]
- 48X/24X/48X CD-RW Drive
- 15" LCD Flat Panel Display
- Microsoft® Windows® XP
- Sound Blaster Audigy with FireWire®
- Boston Acoustics® BA745 Speakers w/Subwoofer
- CD Creator Pack



$229.99

Archos® Recorder 15GB MP3 Jukebox

This palm-sized MP3 Jukebox doubles as a voice recorder.

- Holds up to 250 CDs worth of music
- Simple drag & drop operation – no software required!
- Realtime encoding from line-in or built-in microphone
- Can also store documents, pictures or data

intel inside pentium 4

Creative® NOMAD® MuVo™ 64MB MP3 Player/USB Drive $99.99

$1699

or as low as $48 per month for 48 months at 14.9% APR[2]

Gateway 400xL Notebook

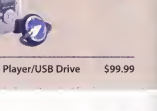
- 15" XGA TFT Active-Matrix Display
- Intel® Pentium® 4 Processor 2.50GHz
- 512MB DDR SDRAM
- 60GB Hard Drive
- Integrated DVD/CD-RW Combo Drive
- Internal V.92 56K Modem[4] and 10/100 Ethernet
- Internal IEEE 1394 FireWire
- Microsoft® Windows® XP Home Edition
- 1-Year Limited Warranty[5]

$1299

or as low as $37 per month for 48 months at 14.9% APR[2]

Gateway 400s Notebook

- 15" XGA TFT
- Intel® Pentium® 4 Processor 2.00GHz
- 256MB DDR SDRAM
- 30GB Ultra ATA Hard Drive
- Integrated DVD/CD-RW Combo Drive
- Internal V.92 56K Modem[4] and 10/100 Ethernet
- Internal IEEE 1394 FireWire
- Microsoft® Windows® XP Home Edition
- 1-Year Limited Warranty[5]



Gateway recommends Microsoft® Windows® XP Professional for Mobile Computing.

AOL Keyword: Gateway

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Shoot, Edit or Jam

www.gateway.com/digitalzone/video

Digital photo solutions

Gateway's 500S Photo PC system featuring the Intel® Pentium® 4 processor is tailor-made for managing and storing your photos — from the 6-in-1 card reader to the huge 80GB hard disk and color-accurate monitor, to the little details like the included Adobe® Photoshop® Elements 2.0 software. Accept no substitutes; a real Gateway Photo PC along with a photo printer and digital camera for real photographers.[1]

$1298

or as low as $37 per month for 48 months at 14.9% APR[2]

- Intel® Pentium® 4 Processor 2.00GHz
- 256MB DDR SDRAM
- 80GB 7200RPM Hard Drive
- 48X/24X/48X CD-RW Drive
- VX930 19" color monitor (18" viewable)
- Microsoft® Windows® XP
- Integrated Audio
- GCS 300 speakers
- Gateway Mid Tower Case
- 10/100 Ethernet
- Survive and Thrive Training[3]
- Dazzle 6-in-1 card reader
- Adobe PhotoShop Elements 2.0

$249.99

Professional photo lab-quality images.

- Up to 5760 X 720 dpi resolution
- Prints up to 8ppm, black
- True BorderFree™ 4 x 6, 5 x 7, 8 x 10 and letter-size photo printing with automatic roll paper cutter
- 6-color demand Micro Piezo™
- One black & one color ink cartridge
- USB cable included, $10 value

Minolta® DiMAGE F100 Digital Camera	$449.99
Canon® Powershot G3 Digital Camera	$799.99

www.gateway.com/digitalzone/video

Digital video solutions

The 700S Movie Creator PC featuring the Intel® Pentium® 4 processor has all you need to make your own DVD movies, including IEEE 1394 FireWire® interface and cables to connect a digital video camcorder, large hard drive for video storage, award-winning Pinnacle® Studio Version 8 movie-making software, DVD/CD recorder and blank media and CD Stomper® kit to make your own video CD and DVD movies. To complete your digital video experience, purchase a Canon® Digital Video Camcorder so you can transfer your old home footage from analog camcorder into the PC and mix it into your new movies.[1]

$1499

or as low as $42 per month for 48 months at 14.9% APR[2]

Gateway 700s
Movie Creator PC

- Intel® Pentium® 4 Processor 2.40GHz w/512K L2 Cache
- 256MB RDRAM®
- 80GB 7200RPM Hard Drive
- DVD-RAM/-R/CD-RW Drive
- 15" LCD Flat Panel Display
- Microsoft® Windows® XP
- Sound Blaster Audigy Audio with IEEE 1394 FireWire
- Boston Acoustics BA745 Speakers w/Subwoofer
- Movie Creator VCD/DVD

$499.99 with PC purchase

Canon ZR45

Digital Video Camcorder

- 18X optical, 360X digital zoom
- Color night-shooting mode
- Image stabilizer
- 8MB memory card for digital photos
- $599.99 regular price

Canon ZR40	Digital Video Camcorder	$449.99 with PC purchase
Canon Elura 40	Digital Video Camcorder	$799.99 with PC purchase*

*after $100 mail-in rebate[4] on the Canon Elura 40 only

$2999

or as low as $84 per month for 48 months at 14.9% APR[2]

Gateway™ 42" Plasma Digital TV

- 852 x 480 Native Pixel with Progressive Scan
- 16:9 Wide-screen Aspect Ratio
- Built-in Speakers and NTSC Tuner
- Ultrathin (less than 4" deep), Wall-mountable
- Remote Control, Tabletop Stand
- 1-Year Limited Warranty
- Picture-in-picture and Picture-on-picture

Delivery, installation and service plans available.[5]

$1499

or as low as $42 per month for 48 months at 14.9% APR[2]

Gateway Profile® 4x

The all-new Gateway Profile 4 all-in-one PC

- 17" TFT LCD Display
- Intel® Pentium® 4 Processor 2.40GHz
- 256MB DDR SDRAM
- 60GB 7200RPM Hard Drive
- 24X CD-RW/DVD-ROM Combo Drive
- Integrated 10/100 Ethernet
- Microsoft® Windows® XP Home Edition
- 1-Year Limited Warranty®

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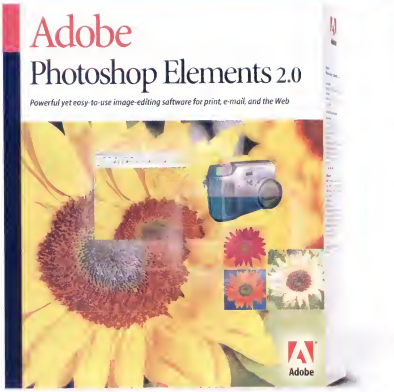
Gateway™
A better way.SM

Software Head-To-Head

Graphic Manipulation

Recipes For A Perfect Picture

Pick The Perfect Photo Editor For Your Home PC



March 2003 Smart Choice • Photoshop Elements 2.0

As of 2002, Lyra Research estimated that so far, people have snagged about 25 billion images with their digital cameras. That means PC users build massive collections of just so-so photos that will never see a printed page—unless they find some way to make these images more useful, which is exactly what photo-editing software does.

Software publishers make dozens of image editors to help you scrub and polish your glut of average-looking images. Most of these editors offer the same basic features that let you quickly adjust color levels or crop your photos; beyond these simple tools, midlevel editors often have additional features that can be very useful.

In this head-to-head review, we'll examine midrange editors that straddle the line between casual and professional image editing. Each program has a full arsenal of simple editing tools supplemented by advanced features that include special effects and filters, layering features, and Web-related tools.

Of course, not every program pays the same amount of attention to each of those features. In this review, we'll point out the strengths of three brand-name editors so that you can buy the editor you need for your own projects.

How We Tested

We started our tests by using each program to perform a few basic tasks. We opened an overexposed image of a yellow flower, rotated and cropped the picture, and tried to balance out the colors. This helped us get a feel for the interface and ease-of-use in each program. Applications that needlessly complicated ordinary tasks lost points with us.

After we fine-tuned our flower image, we cut out images from other photos and integrated them into the blossom. This helped us understand the tools that each program uses to add layers to images, letting users integrate multiple photos to create a single striking piece of work.

We also toyed with the various special effects and filters for which photo editors are renowned. These features are fun but also make for serious tools that can help you exercise your creative muscles. The programs here all came with oodles of effects, but some were easier to use than others.

In addition, we weighed the value of the Web tools that most image editors include. Some users may find these features very helpful, while others may hesitate to pay more for an editor that includes them.

Finally, we evaluated the price and overall power of each program. As you'll see, some programs seemed a little too expensive, especially when you consider that $50 editors have many of the same tools. Other programs had more than enough features but would be overpowering for amateur users.

Photoshop Elements 2.0

$99
Adobe
(800) 833-6687
(408) 536-6000
http://www.adobe.com

Adobe Photoshop is the solitary standard in professional-level image-editing software. And at $600, it costs more than a hefty monthly car payment. This company is keenly aware that average users can't afford their flagship product but also knows that most people would never use half of Photoshop's capabilities. That realization gave birth to Photoshop Elements, a budget- and user-friendly version of Photoshop.

This is only the second version of Elements, but it shows how well Adobe understands its target audience. When you launch the program, you'll have the option to browse a plain but effective tutorial that walks you through a number of essential features.

Of course, once you exit the tutorial, you're bombarded with a canvas liberally saturated with funky-looking editing tool icons and jam-packed menus. After a few minutes of exploring, however, you will see that some of the jumble will actually help make the learning process easier, including Recipes, which are simple walkthroughs for common functions, such as red-eye removal and other image touch-ups.

Not all the tools in this program are so neatly simplified. As with Photoshop, Elements has layering capabilities that let you stack images on top of one another and blend them together in infinite ways. Although these tools aren't as easy to use as the ones in Picture It!, they are more flexible and offer more fine-tuning for users who need extra editing power. That extra power is also more manageable than the insanely detailed features you'll find in PhotoImpact.

Although Elements lacks PhotoImpact's completeness, it's still a well-rounded editor that will meet the needs of most users. It has a relatively clean interface, a readable printed users manual (as well as an excellent Help menu system), and gobs of features that put our next challenger to shame. Because it clearly addresses its audiences' needs, Adobe took home our Smart Choice award.

Picture It! Digital Image Pro 7.0

$109
Microsoft
(888) 218-5617
(716) 871-2915
http://pictureitproducts.msn.com

Say what you want about Microsoft, but don't claim this company isn't doing its best to create a good photo editor. Picture It! Digital Image Pro 7.0 is the easiest program to use in this head-to-head review, yet it still stuffed with worthwhile features.

When you first start the program, you see five main options, including Import From Camera and Scan A Picture, as well as a Help Center complete with a tour, instructional videos, and online photo tips. The tours are well designed and highlight the program's capabilities but end up directing you to the standard main Help menu for details. The videos are much more helpful, with a narrated clip telling you exactly what a few of the more complicated tools are for and how to use them.

Once you close the intro screen, you will see that the main canvas looks much like other image editors, with a couple of differences. There are a lot of icons, but they're more colorful. Clicking an icon almost always brings up an option for help, or even step-by-step assistance, as with the Fix Red Eye feature.

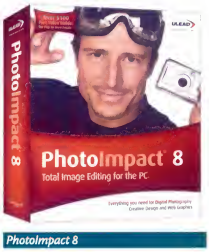
The Fix Red Eye feature is one example of how Microsoft may have oversimplified parts of this program. There are three steps: zoom in, click the reddened portion of the eyes, and then click Red-Eye Auto Fix. There's really nothing to tweak here, so if this automated function doesn't work the way you want, you will have to resort to using less user-friendly tools to complete the job.

There are other automated tools, too, such as those that fix contrast or color levels with just a couple of clicks. Again, these were good for sweeping changes, but at times, we struggled to nail down the exact combinations that made photos perfect.

One feature we did really like was Sharpen Or Blur. We've tested other programs in which these tools accomplish little; in Picture It!, the Sharpen tool brings much crisper edges to images, and the Blur function can take a photo completely out of focus. We also liked the program's ability to make layering an easier process, thanks in part to the Stack view and straightforward menu options.

The Pro addition to this product's name might be a tad misleading. Although you can certainly perform advanced editing functions, you won't have the same range that you'll get in a more professional editor. The online features are rather limited, and as you can imagine, the program steers you directly to MSN Photos, another Microsoft venture. To Microsoft's credit, you can pick a different Web site host, but this isn't your first option.

This program simplifies a number of features that are common in other programs, and many users who do not have the time to learn a more advanced application will be pleased. However, in spite of the price and moniker, this program is more of a revved-up version of programs (namely, Microsoft's lower-end Picture It! products) that are aimed at novice users.



PhotoImpact 8

$89.95
Ulead
(800) 858-5323
(310) 896-6388
http://www.ulead.com

PhotoImpact was the second near professional-level image editor that we tested in this head-to-head review. You'll know it right away, too.

When you first start the program you'll see an amiable Tip Of The Day dialog box. Once you close this box, however, steel yourself for an icon attack unlike any other program in this review. There are dozens of buttons, menus, and options that will make greenhorns gasp in horror.

There are no tutorials here. If you want to learn PhotoImpact, you'll do it the old-fashioned way: through trial and error and by reading the Help menus and handy manual. Beware, though; even the Help menus are written in rather convoluted and esoteric language, so don't expect *PhotoImpact For Dummies*.

That said, the program itself could easily be overwhelming for novices. Just finding a way to rotate an image is difficult amidst the many icons. When you locate and begin using tools, however, you will find that you can fine-tune images with great precision. The Rotate toolbar, for example, lets you dictate the exact angle and direction of each rotation for ultimate control.

There is a plethora of Web tools here, letting you create your own site from scratch and include special effects, such as slideshows and image pop-ups using JavaScript. If you don't like the 800 templates that Ulead provides for such components, you can design your own in just a few steps.

Another reason we liked PhotoImpact so much is that you get a bonus disc with Alien Skin Filters, Hemera GraphicsDesk, and Animation Factor GIF Animation Collection. If you have as many photos as we do, you may also like the PhotoImpact Album that helps organize your image archive.

There's no question that PhotoImpact is the most comprehensive editor in this review. Those who forge ahead and learn the interface will find that PhotoImpact is an immense and powerful program, and thus, professionals will drool over the low price. Amateurs, on the other hand, will need to prioritize user-friendliness and power. Those opting for the former will want to buy another product.

Final Edit

We gave this month's Smart Choice award—by a narrow margin—to Photoshop Elements 2.0. We thoroughly enjoyed the easy-to-use features in Picture It!, but the steeper price and limited flexibility caused Microsoft to lose points; still, novices with deep pockets will prefer Picture It! to the others. PhotoImpact came in a close second to Elements 2.0, with its huge list of tools, bells, and whistles. Alas, its interface is as confounding as any editor we've seen, and only pros will have the time to learn the details.

Photoshop Elements, however, has a menu system that even new users will be able to learn after a few days of work. Better yet, the program has a reasonable price and a range of features we think you'll use often. After you invest a few days to familiarize yourself with Elements, you will be happy with the range of possibilities this program offers. ■

BY NATHAN CHANDLER

BUYING TIPS

We can't say it enough—if you see trial version of a program that you're curious about, download it and try it. It's no fun to buy an expensive program and then realize it has twice as many features as you need.

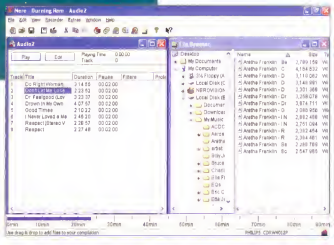
Don't buy the cheapest photo editor you can find, especially if you're an avid photographer. If you do, you'll soon find that products that cost less than $50 often limit your creativity, and in some cases, may actually be harder to use than more advanced editors.

You'll go cross-eyed trying to use a complex editing tool while switching back and forth from the Help menu to the on-screen canvas. Any editor worth its price will come with a printed manual that explains its capabilities in plain English.

Friendly Fire

Nero Burning Rom 5.5.9.8

$69 box, $49 download
Ahead Software
+49 (0) 7248 911 809
(Germany)
http://www.nero.com



If you have a CD-RW (CD-rewriteable) or DVD-R/+RW drive, you need a good authoring program to manage optical drive burning tasks. The "lite" software that is included with most new optical drive recorders is serviceable, but barely. You can create simple data discs and audio CDs with it, but that's about all. Ahead Software's Nero Burning Rom 5.5.9.8 can do so much more. The program includes many tools for knowledgeable computer users who like to have options, but it's still simple enough that uninitiated users can create their own CDs or data DVDs with little effort. You can't use Nero Burning Rom to create video or audio DVDs, though.

For those new to CD burning, Nero Burning Rom does include Nero Express, an easy to use interface with which users can quickly set up and burn data CDs, audio CDs, video CDs, or copy an existing CD. When you open Nero Express, simply choose the kind of disc you want to create from the list that appears, such as Data or Music. If you choose Music, you can create a regular audio CD, or you can create an MP3 or WMA (Windows Media Audio) CD, which holds more songs than the standard audio format. Not all audio CD players support MP3 playback, however, so if you want to play an audio CD you created in your car's CD player, for example, make sure it can read MP3 files.

After you make a selection, Nero Express moves to the next step, in which you choose the files or audio tracks to add to the disc you're creating. Just click the Add button in the upper-right corner of the interface and click a file to select it. Once you've made your selections, click Finished, then Next. Nero Express moves to the next stage, in which you can choose how fast to write the CD (for example, 40X or 24X) and how many copies to make. Click Burn at the bottom of the dialog box and Nero Express creates the CD. It's easy.

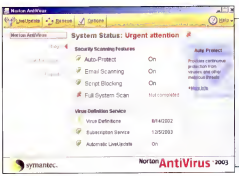
The interface for the standard version of Nero Burning Rom looks a little busy at first, but it doesn't take long to sort out. The right side of the interface contains a File Browser window, which is essentially the same thing as Windows Explorer. Your PC's drives and folders appear in the left half of the File Browser, while the contents of the selected drive or folder appear in the right half. Simply click a file in the File Browser and drag and drop it to the window that appears to the left of the File Browser. The project window (which appears to the left of the file browser) will look slightly different depending upon whether you're creating a music or data CD, but essentially its main purpose is to display the files or tracks you've selected. The project window for data files is rather basic, but if you're creating an audio CD, you can listen to the audio tracks that you've added to the project window, rearrange the order in which they're listed, and even edit them using the Nero Wave Editor.

A meter at the bottom of the interface displays how much disc space will be required for the data or tracks you're recording so you can tell if you're going over the maximum capacity of the disc. Once you've added all of the files or tracks you wish to record to the project window, simply click the Burn icon to create the disc. At this point, you can choose the speed at which to record the disc and the number of copies you wish to create.

We found a lot to like about Nero Burning Rom, but there was one little glitch that we didn't care for. One of the program's best features (potentially) is the ability to back up your entire hard drive. We tried this feature, but we received an error message stating that Nero couldn't create a backup of our hard drive because we were using the Windows XP NTFS (NT file system) 3.1, which Nero doesn't completely support. We were able to create a hard drive backup using a Windows 98 system that used a FAT32 (file allocation table; 32-bit version) file system, but we certainly hope Nero offers support for a WinXP NTFS 3.1 backup soon. Still, Nero Burning Rom is one of the better CD burning programs you will find. ■

BY MICHAEL SWEET

Fortify Your Computer



Norton Internet Security 2003

$69.95
Symantec
(800) 441-7234
(408) 253-9600
http://www
.symantecstore.com

Antivirus software isn't glamorous. It grabs the spotlight for a few minutes when it hunts down a virus and joyfully shows it to you before quarantining the malicious file or erasing it altogether. But when the virus is gone, the antivirus software fades again into your computer's background. Norton Internet Security 2003 also runs quietly behind the scenes, protecting against viruses and plugging the rest of your computer's security holes, which is why we like this suite. You can install it and forget it, knowing your computer is protected.

Norton Internet Security 2003 includes several programs: AntiVirus, Personal Firewall, Privacy Control, Spam Alert, and Parental Control. We installed it on a computer running Windows Me without any problems. Once you complete the installation, Norton walks you through setup (which takes about 10 minutes). Setup explains each program's purpose and lets you customize it. It also scans your computer for programs it should protect from viruses or crackers when you connect to the Internet.

AntiVirus is the backbone of the suite, protecting your system from viruses, Trojan horses, and worms. It scans your computer, protects your email and IM (instant message) application, and updates its virus definitions automatically. Personal Firewall protects your computer against crackers and monitors it for intruders.

Privacy Control protects your most valuable information, such as credit card numbers. (You must enter the information yourself.) If a cracker or malicious program successfully enters your computer, Privacy Control stops the intruder from sending your personal information over the Internet. Spam Alert does not protect you from malicious files. It filters your email and replaces junk email subject lines with "Spam Alert" so you can sort through your email quickly.

What we like best about Norton is that it favors protection over pride. It protects against incoming viruses but also monitors outgoing email to prevent your computer from sending infected email to your contacts in case a virus does enter your computer. It protects against crackers but also looks for successful intruders. Norton offers home users easy to use, comprehensive security. ❚❚

BY JOSHUA GULICK

Do-It-Yourself Publishing

Most of us don't have the room or the money to build a full-on printing press in our home. However, we can probably scrape up $49 to spend on software that does its best to duplicate one.

To install Broderbund's Print Shop Deluxe 15, you need a computer with a 200MHz processor and 64MB of RAM if you're running a Windows operating system other than XP. WinXP users need a 300MHz processor and 128MB of RAM.

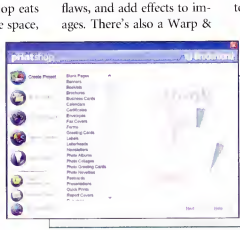
The program includes an installation CD, a program CD, and two art CDs (also available in DVD format). The program and art together consume almost 2GB of hard drive space; however, you can opt to access the art from the CDs and save about 1GB of space.

Although Print Shop eats up a lot of hard drive space, it's worth it. You'll be able to create many different projects, including greeting cards, calendars, and certificates. You'll also be able to create some projects for your home office, such as labels and letterheads.

The easy-to-use interface makes it simple to navigate the software and complete a project with a few clicks of the mouse, even without a users manual (which isn't included). Moreover, Print Shop Deluxe is an image editor that lets you adjust color, set brightness, fix flaws, and add effects to images. There's also a Warp & Distort feature that makes images appear stretched out or off-balance.

Print Shop Deluxe 15 is one of the best publishing programs you can buy for all of your publishing needs. Which pictures you use to create your new slideshow screen saver, however, is up to you. ❚❚

BY MARY LAFFERTY



The Print Shop Deluxe 15

$49
Broderbund
(800) 395-0277
(319) 247-3325
http://www
.broderbund.com

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Impulse Items

Compiled by Joshua Gulick

Cool Stuff For Less Than $20

See it, like it, buy it. Impulse Items are products that capture your attention but won't make you dig too deep into your wallet. Check these pages each month for the latest interesting and inexpensive computing items we've run across.

Basic Cleaning Kit

You might be tempted occasionally to dunk your computer in water, but that is not the kind of bath your computer really needs. The Computer Bath Basic Cleaning Kit ($15; http://www.ourcompanystore.com/computerbath) lets you safely scrub your computer and keyboard. The kit includes Computer Bath's own water-soluble Power Cleaner, several scrubbing tools, cotton swabs, and a 3.5-inch drive cleaner. If you're not sure which tools to use, you can refer to the directions that accompany the tool storage pouch. You can learn more about Computer Bath products at http://www.computerbath.com.

AirClock 2.2

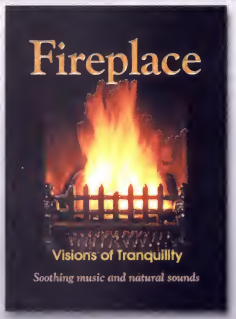
Although the alarm in your PDA's (personal digital assistant's) calendar feature is just loud enough to be annoying, it may not wake up a heavy sleeper. If you'd rather wake up to the television or your stereo, consider AirSpell's AirClock 2.2 ($19.95; http://www.airspell.com). AirClock can activate any appliance that has an infrared port (remote controls communicate with the same port) by beaming a signal from your PDA's infrared port. AirClock features large numbers (no need to squint) and a snooze option. Just set the alarm, aim it at the appliance's infrared port, and get some sleep. You can download a 15-day trial version from the Web site. AirClock works with PDAs running Palm OS (operating system) higher than version 3.0 and lower than version 5.0.

Comfortstylus

Tired of buying a new stylus every few weeks? You might lose your stylus less often if you have it wrapped around your finger. Prime Global Enterprises (http://www.comfortstylus.com) has a flexible stylus you can twist around your finger or thumb. Use it to navigate your PDA (personal digital assistant), then let it rest on your finger while you type a quick note on your computer, sip your coffee, or wave to less techno-savvy people plugging away with their standard styluses. You can buy the Comfortstylus for $5.99.

Nancy Drew: Ghost Dogs Of Moon Lake

Nancy Drew may have been around awhile, but she's not letting her age prevent her from keeping up with the latest technology. If you have a young detective in the house, surprise her with Her Interactive's ($19.99; http://www.herinteractive.com) latest PC game, Nancy Drew: Ghost Dogs Of Moon Lake. As Nancy Drew, you can wander a 3D world and speak with computer characters as you look for clues. If you have trouble uncovering clues, you can ask Nancy Drew's friends for tips or post your question on Her Interactive's message board. Ghost Dogs Of Moon Lake is compatible with Win95/98/Me/2000/XP.



Fireplace DVD

If you don't have a fireplace and you want to spend your evenings in front of a roaring fire, you can either hire a contractor or boot up your computer and pop the Fireplace DVD into your DVD-ROM. DVD International.com's (http://www.dvd-4you.com) Fireplace DVD displays a fireplace complete with burning logs and plays peaceful "night" and Christmas music. You can buy the 70-minute-long high-tech fireplace for $19.99.

RIMS

CD racks let you keep your CDs in protective cases, but they also eat up precious desktop space. RIMS (Removable Interlocking Media Storage) cases let you protect and organize your CDs without taking up more surface area than a standard CD case. The RIMS case even looks like a standard CD case, but RIMS cases have an attachment that lets you stack them on top of each other. Once you've stacked your cases, you can slide the tray (which holds the CD) out of any case without disturbing the stack. You can also download free label making software from http://www.rimsdiscstorage.com if you want to keep your CDs organized. STI Certified (http://www.sticertified.com) offers its RIMS cases for $4.99 per five-pack.

11-Piece Tool Set

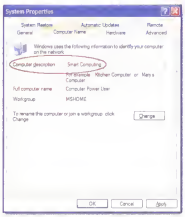
If your computer is having trouble and the manufacturer's tech support has a backlog, you may decide to take a look under the hood yourself. The toolbox in your closet may have everything you need to make repairs around the house, but it probably doesn't have tools built for computers. If your tools are magnetized, they can damage sensitive components of your computer, such as your hard drive. The Fellowes ($13.99; http://www.fellowes.com) 11-Piece Tool Set offers demagnetized tools, including a Three-Claw Parts Retriever, screwdrivers, and a compartmented screw storage box.

Let The Updates Commence!

Since releasing Windows XP SP1 (Service Pack 1), Microsoft has released nine major updates (Microsoft's term for patches), including the five we're covering this month. To find out what updates you may have missed, make sure your computer has a live Internet connection and click Start, All Programs, and Windows Update. Click Scan For Updates, and the program determines what updates aren't already installed. When the scan completes, a list of critical updates appears. These are the updates Microsoft strongly recommends you download and install immediately. Also, check under the Windows Update pane on the left side of the window. If you see any noncritical updates or driver updates listed, click the highlighted links to view them and, if you need them, add them to the current download. When you're ready to begin the download, click Review And Install Updates and follow the on-screen instructions.

The Latest Updates

Before we describe the latest WinXP updates, we thought you might like to know that Microsoft recently changed the naming convention for its Knowledge Base articles. The names used to begin with the letter *Q* followed by a six-digit number; now Microsoft has done away with the Q. This affects what you need to do when searching for details about WinXP updates. To find a Knowledge Base article, go to the Microsoft Help And Support Web site (http://support.microsoft.com), click the Search The Knowledge Base link, and scroll down to find How To Search For A KB Article By ID Number. Type the article number (with or without the Q) in the search box and click the green arrow to find the article. Here's the scoop on the current crop of WinXP updates, some of which were released before Microsoft changed the Knowledge Base article naming convention.



Unlike your own name, you can change your computer's name without filing any legal paperwork; simply type a new name in the Computer Description field on the System Properties dialog box.

Internet Explorer. Just when you thought it was safe to assume that there couldn't possibly be any more Internet Explorer security updates, Microsoft released a critical update: Q324929 Cumulative Patch for Internet Explorer 6 Service Pack 1. This update is actually a package containing five previously released cumulative patches for Internet Explorer, plus an additional patch that repairs a newly discovered flaw that can potentially let a remote user run programming code on your computer. Search Microsoft's Knowledge Base for article number 324929 to learn more about the previously released patches that are included in this update. The update is 2MB and takes about 11 minutes to download.

Security, again. Microsoft recommends that all Windows 98/98SE/NT/2000/Me/XP users install a new critical update, Q329115 Security Update, to solve numerous problems, all of which have to do with how Windows validates digital certificates. A digital certificate is a kind of electronic identification card, and Windows uses specific standards to validate digital certificates when, for example, you install a new hardware component or visit a secure Web site. The problem is that, due to flaws in an earlier update, the validation process can mistakenly identify invalid digital certificates as valid. This flaw can potentially let malicious users gain access to, or even take control of, your computer. The update is 484KB and takes about three minutes to download.

Faxes. If you use WinXP's Fax Console and have noticed that the preview feature doesn't work correctly, the 322011 Recommended Update should solve the problem. It's 412KB and takes about two minutes to download.

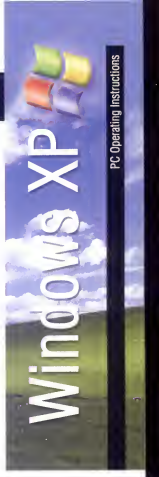
Games. Some computer games run an introductory video when you play them. This type of video can cause the game to hang or quit altogether. To fix this problem, download and install 327979 Recommended Update; it's 862KB and takes about five minutes to download.

Journal Viewer. If you use a device running the WinXP Tablet PC Edition and you've created files using Microsoft Windows Journal For Tablet PC, you won't be able to access those files on your WinXP computer without first installing an update. The update is called Windows Journal Viewer; it's 7MB and takes about 40 minutes to download. ▮

BY CAL CLINCHARD

WinXP Tips

Since WinXP's release, we've encountered dozens of tips for enhancing and customizing WinXP. Here are a few especially handy ideas.



Disappearing Thumbnails

If you're accustomed to viewing image files in Thumbnails or Filmstrip mode in Windows Explorer, you might encounter image files that don't display thumbnails correctly. To correct this, you can refresh Windows Explorer by selecting Refresh from the View menu (or by pressing the F5 key) or refresh the image itself by right-clicking it and selecting Refresh Thumbnail. If that doesn't work, right-click the image, select Open With and Windows And Fax Viewer, click the Save button, select a different format in the Save As Type box (JPEG or BMP, for example), and click Save.

Bad Driver

If you installed a new device driver and find that it doesn't work the way you expected, you can revert to the previous driver or uninstall the new driver. Click Start, Control Panel, Performance And Maintenance, and System. In the System Properties dialog box, select the Hardware tab and click the Device Manager button. Locate the device and click the plus sign (+) next to it to display its drivers. Identify the driver, right-click it, select Properties, and click the Driver tab. Either click the Roll Back Driver button and revert to the older device driver or click Uninstall to delete the current device driver. When you're finished, click OK to close each open dialog box.

Change Your Computer's Name

Perhaps someone else originally set up and named your computer, or you simply want to select a different name to display on the WinXP login screen. To change your computer's name, click Start, Control Panel, Performance And Maintenance, and System. In the System Properties dialog box, select the Computer Name tab. Delete the name that's currently in the Computer Description box and type a new name to replace it. Click OK.

Change Visual Effects

When you access menus, close documents, and perform other common tasks, WinXP uses visual effects that make the associated transitions look smooth. To change these effects, click Start, Control Panel, Performance And Maintenance (or, if you don't see this icon, click Switch To Category View first), and the Adjust Visual Effects link. On the Visual Effects tab, you can click the radio button next to either Adjust For Best Appearance or Adjust For Best Performance and click OK. Or you can click the Custom radio button and check the desired checkboxes, such as Show Shadows Under Mouse Pointer or Fade Out Menu Items After Clicking.

Resize An Image

WinXP lets you quickly resize an image without opening a photo-editing program. To do this, open Windows Explorer by right-clicking the Start button and selecting Explore. Locate the image you want to resize, right-click it, and select Resize Pictures. Click the radio button next to the appropriate size (Small, Medium, Large, or Handheld PC), or click the Advanced button and the Custom radio button to specify a particular size. Click OK. This creates a new file with the image saved at the new size. If you'd prefer to resize the original image without saving it as a new file, before clicking OK click the Advanced button and check the Resize The Original Pictures (Don't Create Copies) checkbox. Click OK.

STATs

The Price Of Windows These Days

With budgets tightening, we decided to find out how Windows XP stacks up, price-wise, with other operating systems currently on the market. Here's what we found, in order of price:

Windows 2000 Professional, Full Version	$319
Windows XP Professional Edition, Full Version	$299
Windows 2000, Upgrade Version	$219
Windows Me, Full Version	$209
Windows XP Professional Edition, Upgrade Version	$199
Windows XP Home Edition, Full Version	$199
Mac OS X Version 10.2 (aka Jaguar)	$129
Red Hat Linux 8.0 Professional	$124
Windows Me, Upgrade Version	$109
Windows XP Home Edition, Upgrade Version	$99
SuSE Linux Professional 8.1	$79
Red Hat Linux 8.0 Personal	$39
SuSE Linux Personal 8.1	$39
FreeBSD Linux	Free

Put Your PCs On The Network

If you have more than one computer in your house and you transfer data between them with removable media, such as floppy diskettes or CD-ROMs, consider speeding up your data transfer and reducing your computer-related headaches by installing a network. A LAN (local-area network) makes transferring files a painless and fast process you can complete without moving from your chair. It also lets you share data in ways that removable data simply doesn't: You can share printers, play a music file located on another computer without transferring the file to your PC, or play a multiplayer video game against opponents on your network. If you have an Internet connection, you can also use the network to share Internet access with the other computers on the network. Microsoft is touting Windows XP's new networking features, but don't rush out to buy a WinXP upgrade. You can use Windows Me's Home Networking Wizard to network computers running Windows 95, 98, and Me in about 45 minutes.

Build A Network

If you have WinMe on at least one of your computers, you have everything you need to configure your network, but the hardware for building the network requires a shopping list. You can probably find everything you need at a local computer store, or you can hunt for better prices on the Internet. Here's what to look for.

Home Networking Wizard
Welcome to the Home Networking Wizard
The wizard guides you through setting up Home Networking, which you can use to share resources such as files, printers, and an Internet connection among the computers in your home.
Your network hardware, such as the devices and cables that enable your computers to communicate, should be installed and set up correctly before you run the wizard. For help setting up your network hardware, see Using Home Networking in Windows Me Help.
To continue, click Next.
Next >
Cancel

Windows Me's Home Networking Wizard boils down network configuration to a few easy questions.

Hub. A hub connects your computers and facilitates the data flow between them. The hub has several ports for the cables that connect it to your computers and your Internet connection (if you have one). Make sure that the hub has enough ports to connect all of the computers you plan to network. Before you buy a hub, decide whether you want your network to run at 10Mbps (megabits per second; a measurement of data transfer speed over networks) or 100Mbps. A 10Mbps network is common in a home or small office setting, and the hardware is less expensive than hardware for a 100Mbps network. Although there is a large difference between the speeds of the two networks, a 10Mbps hub will easily handle data transfers and gaming between the computers on your home network. If you crave speed but are unwilling to buy the expensive 100Mbps equipment, consider a switch instead of a hub. A **switch** is a device similar to a hub that gives each port full bandwidth. For example, a 10Mbps switch transfers data over each port at 10Mbps. A hub spreads the bandwidth across all connected ports, which slows data transfer.

NIC. The NIC (network interface card) lets you connect the network cable to your computer. Most NICs attach to your computer via one of the PCI (Peripheral Component Interconnect) slots in your computer. (Other NICs are available for notebook computers.) Installing the NIC is as easy as opening the computer and sliding the card into the slot. If you don't want to open your computer, you can buy a USB (Universal Serial Bus) adapter that acts as a NIC. Whether you buy an adapter or a NIC, make sure that it runs at the same speed as your hub. You will need one NIC for each computer you plan to connect to your network.

Cables. You can connect each computer to the hub or switch with a CAT 5 UTP (Category 5 unshielded twisted-pair) cable. The CAT 5 cable has RJ-45 connectors at each end, which look like large versions of RJ-11 (phone line) connectors. You can buy CAT 5 cables at any length shorter than 325 feet. If you plan to build a 10Mbps network, you can use slower CAT 3 (Category 3) cables, but you won't be able to use them if you upgrade your network later.

Install each NIC or adapter according to the device's instructions and connect the computers to your hub. The NICs may require you to install included drivers. You will need about 30 minutes to connect three machines to your hub. If you have more than three machines, plan to spend more time. You can connect as many PCs as your hub allows.

Network Configuration 101

Now that you've installed the NIC cards and connected your computers to the hub, you need

to configure each computer to recognize the network. The Home Networking Wizard will do most of the work for you after you answer several questions about your network. Plan to spend about 15 minutes completing the wizard on this machine and another five minutes on each of the other machines in your network.

Start the wizard by double-clicking the My Networking Places icon on your Desktop and then double-click the Home Networking Wizard icon. The first dialog box, Welcome To The Home Networking Wizard, provides a link to Help And Support's Using Home Networking section. You may want to open this link to have help handy during configuration.

The second dialog box lets you specify whether your network will have an Internet connection or share information only between computers in your house or small office on your personal network. Because we are setting up a home network without a shared Internet connection (we'll discuss adding an Internet connection to your network next month), click the No, This Computer Does Not Use The Internet radio button and click Next.

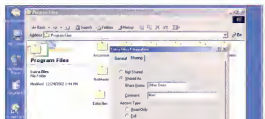
You label your computer in the Computer And Workgroup Names dialog box. Keep in mind that you will identify each computer by its name on the network; if you name your computers A, B, and C, you might get confused later. You may want to name the computer after the room in which it is located or after the person who uses it most often. Once you choose a name, type it in the Computer Name text box.

This step also asks you to specify a name for your workgroup. If you plan to include a large number of computers on your network (or if you plan to connect your network to another network), you can organize the network by department or other groups, but if you are building a home or small office network, you can place all of your computers under a single workgroup heading. Enter a name for the workgroup or click the Use The Default Workgroup Name MSHOME (Recommended) radio button.

Once you have named your computer and workgroup, the Home Networking Wizard lets you set rules about which folders and printers you want to make available to other users on your network. If you have any printers connected to your computer, the wizard displays them at the bottom of the window. Check the box next to the printer(s) you want to share on the network. You can also choose to share your My Documents folder if you want to let other users on the network access the files in that folder. This is the only folder you can share at this point. After you complete the wizard, you can manually adjust the sharing settings for any folder on your computer or even your entire hard drive. Consider setting a password for anything you share on your network. The password helps prevent unauthorized users from accessing your files over the network. The password is important if you have an Internet connection, even if you have protection against intruders, such as a firewall. If a malicious user gains access to your network through your Internet connection, she can access any folders that don't require passwords.

At this point, you've almost completed the wizard—on this machine. You still need to run the wizard on the other computers on your network. Because the Home Networking Wizard is new in WinMe, you'll need to install it on any computers running Win95 or 98. Click the Yes, Create A Home Networking Setup Disk radio button. The next dialog box instructs you to insert your floppy. You can use the floppy to load the Home Networking Wizard on your other computers.

Remove your floppy and press Next when you reach the Completing The Home Networking Wizard step. The final step will ask you to restart your computer. If all of your other programs are closed (they should be), click Yes. Once your computer restarts, the wizard will appear again and explain that you need to run the wizard on your other computers. To run the wizard on Win95, double-click My Computer, then open the 3.5 drive, which is probably the A: drive. Double-click the Setup.exe file.



Assign passwords to protect your shared data.

The Network Is Up

Complete each configuration by checking to make sure the network "sees" the computer. To view the network from your WinMe computer, double-click the My Network Icon on the Desktop, then double-click the Entire Network icon. The window will display each computer's name and an icon. You can access each computer's shared folders and printers by double-clicking the icon. To view the network on computers running Win95 or 98,

double-click the Network Neighborhood icon and open Entire Network.

If you don't see the computer you are looking for on the network list, open the Home Networking Wizard again. You can choose to review and edit the choices you made the last time you ran the wizard, or you can restart the wizard completely. If the computer still doesn't appear on the network after you have tried these two options, consult Windows Me Help And Support.

To reach Help And Support's network troubleshooting section, click Start, Help, and find the Home Networking link under What Would You Like Help With? on the Home tab. Click Troubleshooting For Networks. This Help page offers a long list of related troubleshooting topics, including the Home Networking Troubleshooter, which asks you questions about your network and suggests solutions based on your responses.

Share & Share Alike

Although other users on the network can see your computer (actually, they see the icon and your computer's name), they can't access the data on your computer unless you make it available. You can decide which information your computer shares over the network. You can also determine who accesses the information by creating a password and distributing it to authorized users. For example, if you chose to share your My Documents folder when you were using the Home Networking Wizard, users will see the folder when they open your computer's icon. If you chose a password, they will need to enter it before they can open the folder.

Hubs, such as the five-port Linksys EtherFast hub (http://www.linksys.com), connect multiple computers.

To determine whether file and folder sharing is already active on your Win95, 98, or Me computer, right-click any folder and look for Sharing in the menu that appears. If you do not see Sharing, it is not yet active. Right-click My Network Places in Me (or Network Neighborhood in Win95 and 98) and click Properties. When the Network dialog box opens, click the Configuration tab, and then click the File And Print Sharing button. Check the box next to I Want To Be Able To Give Others Access To My Files, and if you want to share your printers on the network, check the box next to I Want To Be Able To Allow Others To Print To My Printer(s). Then click OK and click OK again in the Network dialog box. You will need to restart your computer before the changes take effect.

Once you enable Sharing and restart your computer, you can choose which folders to make available on the network. Right-click a folder and select Sharing. The folder's Properties dialog box opens, displaying the new Sharing tab. Click the radio button next to Shared As. By default, the folder name appears in the text box by Share Name. If you change a folder's Share Name, the new name appears on the network. However, the folder retains its original name on your computer.

The RJ-45 connector on a CAT 5 cable looks like a large telephone cord connector (RJ-11).

The Sharing tab also lets you determine the folder's access type. Read-Only access lets the user open, but not edit, the documents or programs in your shared folder. Full access lets users open and edit the files. Depends On Password access lets you specify separate passwords for Read-Only and Full access. You can specify a password for any access type or leave the password field blank to let any user on the network use it. Keep in mind that omitting a password leaves your files vulnerable to any malicious user who breaks into your network. Once you select an access type for your folder, click OK. The folder icon now includes a small hand to indicate that it is a shared folder.

Now that the legwork is over, sit back and enjoy being able to access any computer or printer on your network without leaving your chair. Whether your network runs at 10Mbps or 100Mbps, you'll be able to transfer files quickly and without the hassle of removable media. ■

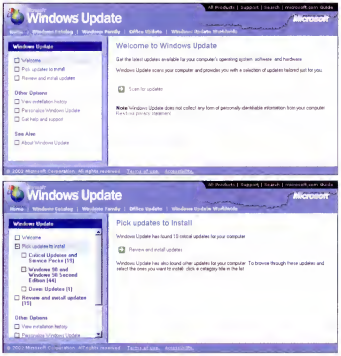
BY JOSHUA GULICK

Make A Date With Windows Update

If you're reading this, you're probably one of the many computer users who hasn't jumped on the Windows XP bandwagon. You have definite reasons for not wanting to upgrade from Windows 98, but you worry that your "older" OS (operating system) is a bit out of date. Put your worries aside: You can add functionality, update the security, and download fixes for known bugs for your Win98 system, and we're here to tell you about it.

Find The Source

Introduced with Win98, the Microsoft Windows Update Web site (http://www.windowsupdate.microsoft.com) helps keep your system up to date by providing OS updates, drivers, and updates for other Microsoft applications, including Internet Explorer, Outlook Express, and Windows Media Player. The updates fall into three categories: Critical Updates And Service Packs, Windows, and Driver Updates. The Critical Update And Service Packs category includes updates that are mainly security-related, while the Windows category includes updates that are basically enhancements to your OS. The Driver Updates category offers updates for your drivers, which let your computer's hardware and software communicate. You should always download and install any of the updates in Critical Updates And Service Packs, but you can pick and choose among the other categories.



The Windows Update Web site scans your system and recommends updates that are appropriate for your configuration. Once the scan is complete, you can choose which updates you want to install.

So you aren't bogged down with hundreds of updates that don't pertain to your system, Windows Update scans your system to determine which version of Windows you're running. It won't automatically scan your system unless you choose for it to, and the scan doesn't collect any private information from you. Through the scanning process, Windows Update compiles a list of updates that are relevant to your configuration.

Other features of the Windows Update site worth mentioning are the View Installation History and Personalize Windows Update. Click the View Installation History link on the left side of the screen, and a list of the updates you've already installed appears. This ensures that you don't duplicate your efforts. The Personalize Windows Update link lets you customize what you see when you go to the Windows Update site. For example, you can choose which categories and updates appear.

You can access the Windows Update site three ways: From the Start menu, select Windows Update; from the Tools menu in Internet Explorer, select Windows Update; or type **http://www.windows update.microsoft.com** in the Address line of IE. To use the Windows Update site, you must have a registered copy of Windows, be connected to the Internet, and be using IE as your browser. You'll also need to enable ActiveX controls, which are interactive elements (such as checkboxes and radio buttons) on Web pages. To do this, from the Tools menu in IE, select Internet Options. On the Security tab, click the Custom Level button in the Security Level For This Zone section. Once the Security Setting dialog box appears, scroll to the Run ActiveX Controls And Plug-Ins option and click the Enable radio button.

Get To The Updates

At the Windows Update site, you may see a message that says the site is checking for the latest version of the Windows Update software. During this process, you may see security messages; if so,

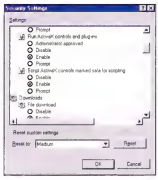
verify they are from Microsoft and click Yes to continue to install the software.

Once the Windows Update software is installed, the Welcome To Windows Update screen appears. To get the latest available updates for Win98, click Scan For Updates, which scans your systems to create a list of available updates tailored to your system.

Once the scan is complete, the Pick Updates To Install screen appears with a Review And Install Updates link. You'll also see the three categories of updates on the left side of the screen: Critical Updates And Service Packs, Windows, and Driver Updates. Our scan produced 19 Critical Updates And Service Packs, including updates for Internet Explorer, Outlook Express, and Windows Media Player; 44 Windows updates for Win98 and Win98SE; and one Driver Update. You can click each category to browse the updates available, but you'll need to install the critical updates first.

Click Review And Install Updates to see the Total Selected Updates Screen, which lets you choose the updates you want to install. You can also view the file name, file size, and a brief description of the update. At this point, you can click Install Now to download and install all of the updates, or you can remove the updates you don't want. We chose three of the critical updates and clicked Install Now. When the license agreement appears, click the Accept button. The three files we chose totaled 1.4MB and took almost 10 minutes to download and install. Once the installation is complete, you are prompted to restart the computer. Click Yes. After the restart, return to the Windows Update site to download any Windows and Drivers updates that you might need or want.

Because Win98 doesn't automatically scan for updates, you'll need to frequently check the Windows Update site. You can even set the Windows Update site as your home page, or you can download and install the Windows Critical Update Notification 4.0 update so you'll never miss a critical update again. With this installed, whenever you connect to the Internet, your computer is scanned and you are notified of any new critical updates.



To ensure a successful scan by the Windows Update Web site, you'll need to make sure you're connected to the Internet, running a registered copy of Windows, and that you've enabled ActiveX controls on your PC.

Latest Doesn't Mean Greatest

Although you may not have the latest OS available, you're pretty sure you have the greatest for your situation. If you make frequent visits to the Windows Update site and keep up with the updates you find there, you can be assured that your OS stays up to date. ■

BY DANA MONTEY

Information Everywhere

The Windows Update site isn't the only place to go for information on Windows 98. Here's a brief description of other sites you might want to take a look at:

Windows 98

Microsoft still maintains a site dedicated to Win98 (http://www.microsoft.com/windows98) that contains information on using Win98, available downloads, and support for the OS (operating system). If you click the Windows 98 Support Center link in the Support section, you're taken to another site that includes information on current Win98 issues, as well as step-by-step instructions and how-to articles.

Microsoft Security

If security is your biggest concern, check out the Microsoft Security Site (http://www.microsoft.com/security), which offers security and privacy information for IT (information technology) professionals, developers, home users, and businesses. You'll see links for security bulletins and virus alerts, and if you scroll down to the For Home Users section, you'll see links for keeping up to date on protecting your privacy and safeguarding your system. Click Home Users on the left side and you can access the Security & Privacy For Home Users site, which has even more information on the basics of security and privacy.

Computers On The Cheap

Are Bargain Basement PCs Worth It?

YOU'VE PROBABLY SEEN the ads by now, where computer superstores and online retailers offer complete desktop systems for less than $1,000 and slimmed-down systems for less than $500. Sure, most of the sub-$500 systems don't come with peripherals, such as monitors and printers, but the idea of spending so little for a system that would've cost twice as much a couple years ago runs counter to common sense. That weary cliche, "you get what you pay for," sticks in your craw as you wonder: Are discount PCs a good deal or more trouble than they're worth?

The answer depends on what you want to do with your computer. If, for example, you want to touch up 20MB image files, play the latest 3D computer games, and author your own digital movies on DVD, bargain basement computers most likely won't suffice. If, on the other hand, you need a system that will simply let you surf the Internet, write letters, and prepare your taxes, a low-priced PC will probably do the trick.

Shop Smart

Thinking about the programs you intend to use and considering the system requirements your computer must meet to run those programs are excellent steps toward deciding whether a discount computer is right for you. But there are also other issues you should consider. We took a look at the current crop of low-priced desktop systems—their components, upgrade potential, and warranties—and found plenty of good deals. Let's walk through the things you should keep in mind when you consider purchasing such a system.

Processor and memory. The CPU and memory act as the "brains" and, well, the "memory" of your computer. A CPU with a high clock speed lets you run programs efficiently, and a large amount of memory improves your computer's multitasking capabilities and overall performance. As newer, faster CPUs and higher-capacity memory modules enter the market, the older, relatively slower CPUs and lower-capacity memory modules go down in price.

This news is both good and bad when it comes to buying a budget PC. Leading CPU manufacturers Intel and AMD (Advanced Micro Devices) churn out faster CPUs so quickly that the price drop for older CPUs is swift and significant, and memory manufacturers such as Micron Technology quickly build modules with higher capacities to keep up, as well. The good news is that PC manufacturers can take advantage of these price drops immediately and pass the savings on to you, the consumer, by designing budget PCs with slightly slower CPUs and less memory. The bad news is that buying a PC with previous-generation CPU and memory puts you that much further behind the times. You may, for example, have to upgrade your computer's memory to meet the system requirements for the latest video-editing program. Again, it all depends on what tasks you want to accomplish.

The latest Intel Pentium 4 processor has a 3.06GHz clock speed and costs $637, and AMD's new Athlon XP 2800+ costs $397. Most budget PCs include earlier versions of the Pentium 4, which cost hundreds less, or lower-priced Athlon XP processors. Some manufacturers, such as eMachines, favor Intel's cheaper, lower-performance Celeron processors. Memory can be more important when it comes to general system performance, so check the system requirements for the programs you intend to use before settling for a lesser amount of memory. Most discount PCs come with 128MB of RAM, but you might need 256MB or more to handle your potential workload.

Hard drive. Capacity is the most obvious factor to consider when comparing hard drives, but there are other considerations, as well, such as spindle speed and reliability. Most low-priced hard drives spin at 5,400rpm (revolutions per minute), but if you can find a

system with a 7,200rpm hard drive, you'll notice faster performance. For reliability, try to determine a hard drive's manufacturer before purchasing a system; IBM, Maxtor, Seagate, and Western Digital are among the better-known manufacturers of quality hard drives. Most inexpensive systems include a 40GB or 60GB hard drive. Whether these capacities are acceptable depends on how you'll use them; your software's system requirements come into play here, too.

Video performance. Some consumers mistakenly assume that a fast CPU, plentiful memory, and a nice monitor are all it takes to experience good video performance. Although these things do indeed help, the graphics processor and video memory are also vitally important. High performance systems contain a separate video card dedicated to the task of video processing; some have 128MB of video memory and cost nearly as much as a budget system. Low-priced systems, on the other hand, typically don't have a separate video card; instead, the video processing is actually done by a microchip on the system's motherboard.

This doesn't mean that graphics won't look good on your monitor when browsing the Internet or looking through your digital photographs. But it does mean that editing large images might be an extremely slow ordeal, and some computer games might not work at all. Even the screen savers and some of the 3D games in Microsoft's Plus! For Windows XP package won't work on a system that doesn't have a video card with at least 16MB of video memory.

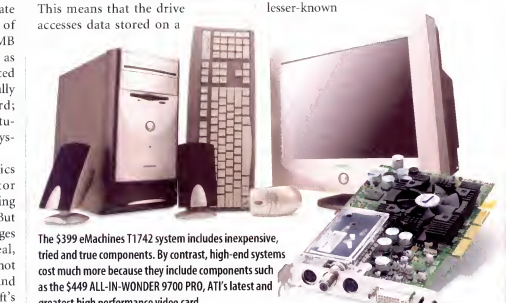
Audio performance. When it comes to audio, a computer is only as good as its audio processor, or codec (compressor/decompressor), and its speakers. If you want the audio coming out of your PC speakers to sound as if you were attending a live symphony performance, you could easily spend your entire budget on a sound card and Dolby Digital 5.1-channel SurroundSound speakers. But if you can put up with clear but unspectacular audio performance, you should have no qualms about using the audio components that come standard with the typical budget PC. Like the video processor, most budget PCs have an audio codec as part of the motherboard, and the package normally includes a pair of small stereo speakers.

Optical and floppy diskette drives. Virtually every new low-priced PC comes with a 3.5-inch floppy drive partly because 3.5-inch, 1.44MB diskettes are so ubiquitous and partly because the drives are so cheap ($15 or less, retail). CD drives have also become inexpensive over the past couple of years. CD drive speeds are indicated by a number following the letter X. This means that the drive accesses data stored on a CD at a rate of up to 150KBps (kilobytes per second) times the number indicated. Four years ago, a 16X CD-ROM drive (that is, one that accesses data at a rate of 2,400KBps) was plenty fast, but today even a budget system should include a 56X CD-ROM drive.

Most of the low-priced systems we found include a CD-ROM drive, but some have a CD-RW (CD-rewriteable) drive. The $499 eMachines T1840 has a 40X/12X/40X CD-RW drive (one that writes, or burns, data to CD-R/RWs at up to 40X, rewrites data to CD-RWs at up to 12X, and reads CDs at up to 40X), for example. That's about as fast as the CD-RW drives found on most mid-priced systems. If you settle for a lower-speed CD-RW drive, you'll notice that burning a CD can take minutes longer than with a faster CD-RW drive.

Software. You might not expect to get much in the way of software with a low-priced PC, but some manufacturers come through with hefty software bundles. Compaq, Dell, and HP, for example, all offer budget systems loaded with Windows XP Home Edition and programs to help you do anything from basic computing tasks to burning your own CDs.

We did find, that systems from lesser-known manufacturers, however, came with little or no software. Some, such as those from ACL Computers (http://www.acl-computers.com), don't even include an OS (operating system) and charge an extra $100 or so for WinXP. If you're well versed in Windows alternatives such as the free, open-source Linux OS, such a system can save you some bucks. Microtel offers a kind of middle ground with its desktop systems, which use Lycoris' Linux-based



The $399 eMachines T1742 system includes inexpensive, tried and true components. By contrast, high-end systems cost much more because they include components such as the $449 ALL-IN-WONDER 9700 PRO, ATI's latest and greatest high performance video card.

Gateway's 300 Series desktop systems include Intel Celeron or Pentium 4 processors and sell for as little as $399 after rebates.

Desktop/LX OS and sell at Walmart .com for as little as $199.

Ports & connectivity. Before buying a system, you should make sure that it comes with the necessary ports for adding peripheral devices such as printers, scanners, and digital cameras and it contains a modem and/or a network adapter for connecting to the Internet. We didn't find this to be problematic with low-priced systems, though, as almost every system we studied included a standard set of ports (serial, parallel, and PS/2), USB (Universal Serial Bus) ports, and both a modem and network adapter. Some systems also had the latest high-speed USB 2.0 and IEEE 1394 (FireWire) ports, which are a plus if you have portable devices that use these ports.

Upgrade potential. If you plan to use your budget PC for more than a few years, it's a good idea to make sure you can upgrade as needed. Find out how much memory the motherboard will support, as adding more memory is a quick and easy upgrade that has a significant effect on system performance. Most of the budget PCs we found supported as much as 1GB or 2GB of memory, with a few supporting as much as 3GB. Any of these should serve you well.

Also consider how many expansion slots are available on the motherboard. You can use available PCI (Peripheral Component Interconnect) slots to add components, such as audio cards and TV tuners, and available AGP (Accelerated Graphics Port) slots to add video cards. Additionally, check into how many drive bays are available. You can use available 3.5-inch bays to add extra hard drives or available 5.25-inch bays to add CD or DVD drives. Of course, you can also replace the current drives with better drives later on.

Find Out More

Knowing exactly what you're buying is key to making a worthwhile computer purchase. In addition to understanding the company's return policy and the product warranty (one year is common for low-priced systems), it's always a good idea to read product reviews and find out what other users have to say about a particular computer. *Smart Computing* subscribers can visit our Web site (http://www.smartcomputing.com) and click the Read Hardware Reviews & Create Comparison Charts link to find reviews of systems and individual system components. The site also lets you weigh in with your own product reviews. One other good source of information is Epinions.com (http://www.epinions.com), which features user reviews of computers and other products. ■

BY CAL CLINCHARD

Are Refurbished Computers A Good Deal?

The fact that a computer consists of used and overhauled parts doesn't necessarily make it a bad deal. In fact, there are plenty of reputable refurbished PC dealers located across the country and on the Internet: PCToday.com (http://www.pctoday.com), the Dell Outlet (http://www.dell.com/outlet), and the Hewlett-Packard/Compaq Factory Outlet (http://www.hpfactoryoutlet.com) are but a few good places to start. Here are some important guidelines to follow when hunting for a used or refurbished computer.

- Know what you're buying before you buy it. Make sure you know exactly what components the system includes and read the return policy and warranty information carefully.
- If you're buying online from a lesser-known vendor, verify the vendor's name, street address, and telephone number before making the purchase. Also, be wary of businesses that have been around for a short time. If you're unsure about a company's business practices, visit the BBB (Better Business Bureau) online (http://www.bbb.com), click Check Out A Company, and type the required information in the search form to see whether the company has a good or bad record with the BBB.
- Take good notes along the way. Keep track of the company information and every transaction you make. If you're buying online, print out everything as you go. Having a paper trail is extremely helpful if you experience problems with your new computer down the road. This is also why it's best to use a credit card when shopping online, as opposed to using cash, check, or money order.
- Don't let the computer sit around unopened after you buy it. Hook everything up and use it right away to make sure it doesn't have any glaring problems.
- If the vendor fails to live up to its warranty and technical support policies, report the company to the BBB or use the Federal Trade Commission's Complaint Form (http://www.ftc.gov/ftc/complaint.htm).

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Compiled by Nathan Chandler
Graphics & Design by Erin Rodriguez

The Skinny On LCDs

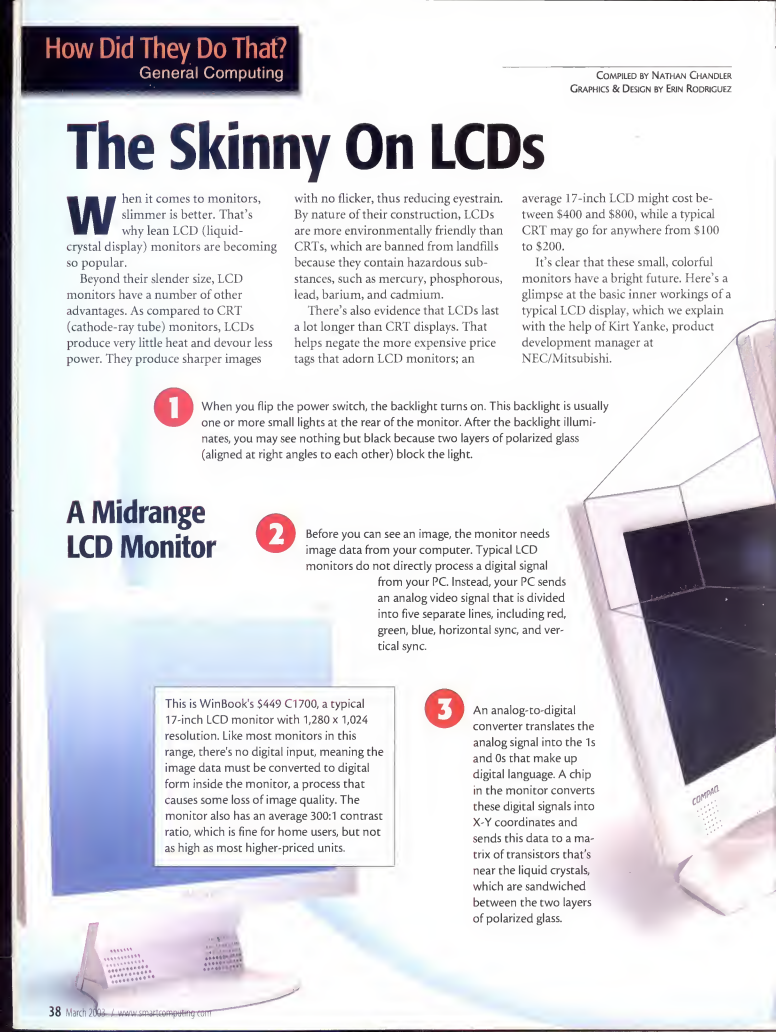
When it comes to monitors, slimmer is better. That's why lean LCD (liquid-crystal display) monitors are becoming so popular.

Beyond their slender size, LCD monitors have a number of other advantages. As compared to CRT (cathode-ray tube) monitors, LCDs produce very little heat and devour less power. They produce sharper images with no flicker, thus reducing eyestrain. By nature of their construction, LCDs are more environmentally friendly than CRTs, which are banned from landfills because they contain hazardous substances, such as mercury, phosphorous, lead, barium, and cadmium.

There's also evidence that LCDs last a lot longer than CRT displays. That helps negate the more expensive price tags that adorn LCD monitors; an average 17-inch LCD might cost between $400 and $800, while a typical CRT may go for anywhere from $100 to $200.

It's clear that these small, colorful monitors have a bright future. Here's a glimpse at the basic inner workings of a typical LCD display, which we explain with the help of Kirt Yanke, product development manager at NEC/Mitsubishi.

A Midrange LCD Monitor



1 When you flip the power switch, the backlight turns on. This backlight is usually one or more small lights at the rear of the monitor. After the backlight illuminates, you may see nothing but black because two layers of polarized glass (aligned at right angles to each other) block the light.

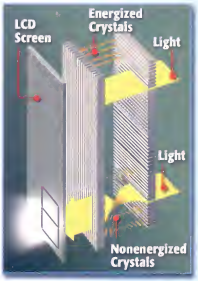
2 Before you can see an image, the monitor needs image data from your computer. Typical LCD monitors do not directly process a digital signal from your PC. Instead, your PC sends an analog video signal that is divided into five separate lines, including red, green, blue, horizontal sync, and vertical sync.

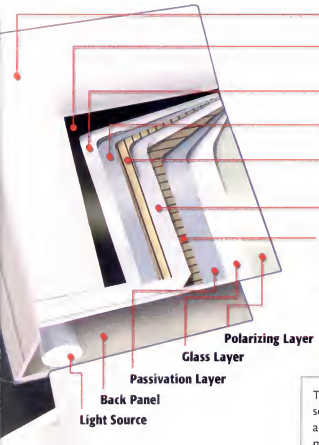
This is WinBook's $449 C1700, a typical 17-inch LCD monitor with 1,280 x 1,024 resolution. Like most monitors in this range, there's no digital input, meaning the image data must be converted to digital form inside the monitor, a process that causes some loss of image quality. The monitor also has an average 300:1 contrast ratio, which is fine for home users, but not as high as most higher-priced units.

3 An analog-to-digital converter translates the analog signal into the 1s and 0s that make up digital language. A chip in the monitor converts these digital signals into X-Y coordinates and sends this data to a matrix of transistors that's near the liquid crystals, which are sandwiched between the two layers of polarized glass.

Liquid Crystals Do The Twist

The liquid crystals in your monitor are squeezed between two layers of polarized glass, which act as filters. Both layers are etched with lines—one layer has horizontal lines and the other has vertical lines. Without an electrical charge, light passes through the first glass layer at the angle dictated the etched glass dictates and then through the deactivated liquid crystals. It then halts at the second glass layer. With an electrical charge, however, the crystals twist and form a pathway for light between the first and second glass layers.

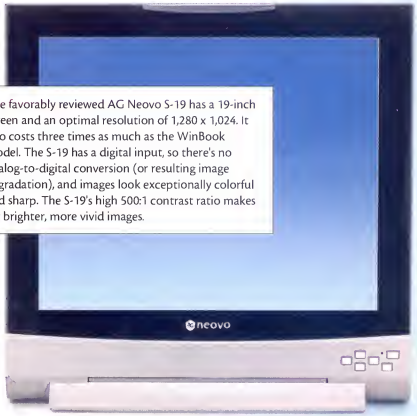




4 The signals are routed to X and Y coordinates on the transistor matrix. When transistors at specific coordinates receive an electrical charge, the transistor excites the liquid crystal next to it. The crystal will twist (see pullout graphic) and become a pathway for light between the two layers of polarized glass. As the light passes through, it also traverses a red, green, or blue color filter. The crystals work in tandem with the polarized filters to emit specific levels of these colors that form the crisp and detailed images you see on your monitor.

On The High End

The favorably reviewed AG Neovo S-19 has a 19-inch screen and an optimal resolution of 1,280 x 1,024. It also costs three times as much as the WinBook model. The S-19 has a digital input, so there's no analog-to-digital conversion (or resulting image degradation), and images look exceptionally colorful and sharp. The S-19's high 500:1 contrast ratio makes for brighter, more vivid images.



You Can Take It With You

Compact Devices Add To Your Storage Options

Is the floppy dead? Compact storage aficionados like to think so, and this time they may be right. Today's compact storage devices have more than just capacity going for them: they use a near-universal connection standard (unlike Zip drives) and are a snap to write to (unlike CDs). Traveling professionals, students, tech workers, and anyone who often works on multiple machines will find a surprising array of uses for compact storage.

Inside Compact Storage

The emergence of compact storage is due primarily to the development of solid-state technology and the proliferation of lightweight, portable consumer devices. Solid-state devices transcend the size limitations of traditional storage by eschewing moving parts. Emmett Jorgensen of Interactive Media Corp. (maker of the KanguruMicro line) summarizes the technology as "a tiny grid (like the cells of an Excel Spreadsheet) with a tiny electrical charge. As information is stored on the drives, certain cells are charged, others are not, giving the data a distinct pattern." This eliminates mechanical restrictions, allowing for lightweight, fast, and durable storage media.

The recent adoption of compact storage also owes much to the emergence of USB (Universal Serial Bus) as a nearly universal connection and interface standard. Combine small size and ihgh speed with USB's compatibility and ease-of-use and you get a very useful computing tool. To the OS (operating system), such devices look just like another disk drive, thanks to USB's (and the OS') plug-and-play ability to mount a device to the system on the fly.

What's Out There?

Compact storage devices fall into several categories. Though innovation always blurs categorical lines, devices can be organized into three distinctive groups.

Basic storage. The simplest compact storage devices just store data. Without security or extra features, they are most similar to floppy diskettes (except for the higher capacity, greater speed, and smaller size, of course). Ideally, you simply plug them in and transfer files back and forth. They are mostly platform independent (as long as your OS is USB-compatible), and mostly driverless, though not necessarily for all OSes. (Windows 98 often requires special drivers, and USB isn't supported at all on WinNT. Check the documentation for your platform and version.) They allow the quick and easily transfer and storage of any type of file. They have no software utilities or special buttons, but may come with a free neck strap or USB extension cable. Be careful: There is no security layer. The extent of your protection may be a physical write-protect switch to prevent accidental overwriting or erasing. There are dozens of such products out there, and we reviewed several of the most popular in the "Compact Storage Roundup" sidebar.

Storage plus. Some devices have extra features, the most prominent of which is security. Controlling access to files is a must-have for corporate users and those wanting to store personal or sensitive information. Most of these devices include password protection, although the ThumbDrive Touch adds a thumbprint biometric option. Some secure devices protect the entire drive. Others let the user create public and private partitions, leaving a section of the device open while closing off the rest. Security is an attractive enhancement, but keep in mind that resetting the device (if you forget a password or transfer ownership) will wipe out all the data. If the password-management application launches from an EXE file, secure content may not be accessible on other OSes. Most of these are also driverless; the password and login utilities are preinstalled on the device. Some, such as the ThumbDrive Secure, require client-side software to access the login features, limiting their portability but enhancing their security.

Another category of extras includes expandable or removable storage. These devices let users add or replace physical storage media. As flash

memory and other storage technologies expand, this flexibility is of increasing importance. For example, the SanDisk Cruzer and SimpleTech Bonzai Mini-Drive work with standard SD (Secure Digital) and MMC (MultiMediaCard) media that you can remove or replace with a card from another device (such as a camera), essentially making them super-portable card readers. According to SanDisk's Eric Bone, this gives you the "ability to upgrade the product as storage prices drop." And the KanguruMicro Drive+ takes the approach further: It includes both permanent storage *and* a built-in slot for adding an additional SD card. As a result, your machine actually sees the device as two drives. Expandability is great, but you have to protect your media outside the device: SD and MMC cards are durable, but small enough (about the size of a postage stamp) to easily lose.

Special purpose devices. A few devices also include utilities that provide additional functionality, the most popular of which is the ability to play back media files in addition to simply storing data. For the most part, they automatically recognize media files (MP3s and WMAs, mostly) in the device's root directory and provide control buttons for managing your music. Again, some are driverless and some require proprietary file management software. And, whereas pure storage devices simply rely on their USB connection for power, media player functions rely on battery power for playback when not connected to your computer.

Other special purpose devices let you perform system backups. Portable backup systems, such as CMS's ABS*plus*, operate like other compact storage devices but also include utilities necessary to perform manual or scheduled system backups. Install the included software, configure your preferences for what to include, and create a compact, portable system backup. Easier to use than tape drives, these leave you no excuse for not backing up your system.

Tips & Considerations

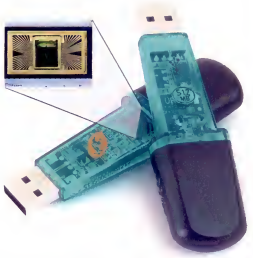
As simple as these devices are, there are still some things to keep in mind when you're shopping for a compact storage device.

Don't pay for special features you don't need. Expect to pay 50 cents to $1 per megabyte, with the cost dropping as capacity increases. Secure devices don't cost any more than basic storage, but expandability and special functions will cost extra. Buy as much capacity as you can afford. You'll be amazed at how your demand for storage space expands to fill your capacity. How much does quality really matter? It depends on what you're storing and why. Transfer speed for these devices is largely overrated. Yes, some devices are significantly faster than others; but unless you're transferring huge files, you won't notice much of a difference.

Location, location, location. If your USB ports are on the back of your system, get an extension cable or a hub. You do *not* want to crawl behind your computer every time you want to save something. If you don't have a hub, make sure your device includes a USB extension cable. Pay attention to how the device will fit into the ports. Will it crowd out other devices? Is it comfortable to carry? How portable do you want it to be? Many devices have built-in key rings. Having the device handy is good, but do you really want to subject your data to the daily abuse your keys take? If so, get a sturdy device. If not, get a larger device; it'll be harder to lose. Make sure you have a cover for your USB connector: It can get dirty or break if left unprotected. (SanDisk's Cruzer has a retractable plug, meaning that there's one less part to lose.)

Beware of the proprietary software trap. Don't buy anything that requires you to install special software from a CD, unless you have a specific purpose in mind that such a setup serves. For example, if you know you're going to be moving sensitive files from your work PC to your home computer, a secure system requiring client-side software makes sense. And backup utilities need special software. But proprietary software limits general portability, unless you want to carry CDs around all the time.

Boot from the device. The main objection remaining to floppy apologists is bootability. Until you can boot from a compact storage device, they say, you still need to keep your floppy drive around, just in case. Well, you *can* boot from many compact storage devices. Simply create a startup disk to your compact "drive" or copy the boot disk files to it. The trick is getting a motherboard capable of booting to USB, and this feature is getting more common in new models.



The solid-state technology in this DiskOnKey example has no moving parts, making it compact, reliable, and fast.

Remove devices properly. When the device is mounted, the OS "remembers" it and expects it to be there whenever it checks. If you remove the device, you could crash your system or corrupt your data. In Windows, use the Safely Remove Hardware system tray icon.

Sturdy, but not indestructible. More than one person has sent a compact storage device through the washing machine. (Don't expect your data to come

out clean.) Think twice about putting your device on your key chain, and keep it out from underfoot and out of the hands of chewing toddlers.

Faster & More Secure

What does the future look like? Besides tech industry givens (smaller sizes, faster speeds, higher capacity, lower prices), look for a reliance on faster transfer rates (especially USB 2.0) and improved security. Extra features, such as expandability, wireless connectivity (using Bluetooth), and multifunction devices, will continue to increase in importance. JMTek is even working on a waterproof version of their USBDrive. Enterprising users are already using devices to pass out portfolios and resumes; companies distribute images and media guides on custom-printed USB keys. Techs use them to carry drivers and application patches. In the end, compact storage devices look like the best bet yet for replacing the floppy. ■

BY GREGORY ANDERSON

Compact Storage Roundup

Basic Storage

FujiFilm USB Drive: 32MB to 512MB; $35 to $350; http://www.fujifilm.com
Description: Long and sleek shape makes it easy to fit amongst crowded USB ports. **Issues:** So light you have to question its ruggedness.

ThumbDrive Smart: 16MB to 256MB; $30 to $200; http://www.thumbdrive.com
Description: Smallest device reviewed and completely driverless. **Issues:** So small, you might lose it.

M-Systems DiskOnKey: 8MB to 512MB; $25 to $400; http://www.diskonkey.com
Description: Includes its own processor, so it can run applications too. **Issues:** A little more expensive than its counterparts.

Secure Storage

ThumbDrive Secure: 16MB to 128MB; $30 to $110; http://www.thumbdrive.com
Description: Most secure product reviewed. Your computer can't even see it without a password. **Issues:** Security software needed to log in. Great if you only use a couple machines. Otherwise, carry the CD around.

ThumbDrive Touch: 16MB to 256MB; $70 to $250; http://www.thumbdrive.com
Description: Our only biometric device. Access via fingerprint or password. **Issues:** The print reader can be unreliable.

EasyDisk: 16MB to 512MB; $25 to $230; http://www.easydisk.com
Description: Uses preinstalled "passid" application to password-protect the entire drive. **Issues:** Macs don't run executables, so EasyDisk won't work on them once you activate security.

JMTek USBDrive: 16MB to 1GB; $30 to $700; http://www.jmtek.com
Description: Small and rugged, differently priced models include different preinstalled software packages. **Issues:** Setting up features is less intuitive than with other products.

Removable/ Expandable Storage

SanDisk Cruzer: 32MB to 256MB; $40 to $190; http://www.sandisk.com
Description: A slider protects the USB plug and ejects the removable SD or MMC memory card. **Issues:** The shape of the case makes it hard to squeeze into the area around the ports on your PC or USB hub.

Kanguru MicroDrive+: 32MB to 512MB; $40 to $340; http://www.kanguru.com
Description: Built-in storage combined with an expansion slot for memory cards. **Issues:** Your PC will see two drives, one of them inaccessible if you don't use an expansion card.

SimpleTech Bonzai Mini-Drive: 64MB to 512MB; $75 to $430; http://www.simpletech.com
Description: Compact and sturdy device with well-protected media. **Issues:** Sometimes you have to wiggle it to get the right connection.

Special Purpose Storage

CMS ABS*plus*: 20GB to 60GB; $300 to $500; http://www.cmsproducts.com
Description: Huge capacity storage with special software for performing and scheduling system backups. Definitely the high end of this roundup. **Issues:** Larger and more expensive than other devices here, but with good reason.

Creative MuVo: 64MB to 128MB; $130 to $170; http://www.creative.com
Description: Plug in the USB key for file transfer, snap on the battery pack for music playback. Plays both MP3s and WMAs.
Issues: USB plug is dangerously exposed when not in the battery pack. Don't carry MuVo around loose.

IRiver iFP Series: 32MB to 256MB; $80 to $200; http://www.iriver.com
Description: Large music player with control buttons and a display screen. **Issues:** Requires proprietary software, severely limiting portability.

KanguruMicro MP3: 64MB to 256MB; $100 to $200; http://www.kanguru.com
Description: Driverless file storage and MP3 playback in one unit. Built-in battery recharges through USB port.
Issues: Only six hours of battery life, then you have to charge up. (You can't even replace the battery with a new or previously charged one.)

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Share & Secure

Thinking About Broadband? Think About A Router

One of the biggest problems new broadband users face is the variety of potential hardware available, especially if they want to share or protect an Internet connection. Dial-up users plug in a modem and go. Although cable and DSL (Digital Subscriber Line) users can do nearly the same, they won't get the most from their expensive connections if they do. It's possible to use software, such as Microsoft's Internet Connection Sharing, to let multiple PCs access one Internet connection, but this method has drawbacks. First, the incoming connection attaches to only one PC, and that PC must be turned on at all times so the other machines on the network can access the connection. By using a router, you can avoid this problem and many others. Routers segregate networks and direct network traffic, and they work wonders when connected to a home network.

Network Fundamentals

Before discussing the specifics of how routers work, it's important to look at how data is transmitted over a network—specifically how data is transmitted over the Internet. First, any file flagged for transmission over a network is converted using a certain protocol. Protocols are sets of rules that determine how data is handled as it travels across a network (or a series of networks). There are many protocols from which to choose, but the one used for sending data back and forth over the Internet is TCP/IP (Transmission Control Protocol/Internet Protocol). The TCP portion of the protocol opens a connection between your computer and the computer with which you're sharing data. IP prepares data for transmission by dividing large files into discrete units called packets and labeling each outgoing packet with the IP address of the destination computer. Every piece of networking hardware on a TCP/IP network has an IP address, expressed using four numbers, separated by periods, that range from zero to 255 (XXX.XXX.XXX.XXX). Packets are reassembled into a duplicate of the original file when they reach the destination computer.

During packet transmission, routers come into play. Routers connect one LAN (local-area network) to another. They're also used to separate one large LAN into several LANs, meaning they can separate a home network from the Internet because the Internet is basically an enormous LAN called a WAN (wide-area network). Routers also are designed to check the destination addresses of incoming packets and pass packets intended for other recipients along toward their destinations, forwarding packets from one router to the next until they end up at their assigned target. Because packets can theoretically take any route, routers use special tables to move the packets along as efficiently as possible.

Routers have many uses, but we're discussing only their usefulness in home networks in this article. The most useful service they provide is NAT (Network Address Translation), which keeps IP addresses on your home network separate from those used by devices on the Internet. This lets you run any number of PCs and other network-enabled peripherals behind the router with any number of unique IP addresses, and the router prevents outside computers from "seeing" the computers and devices on your network. Instead, the router and its IP address act as the sole point of contact between your network and the Internet, and the router directs incoming data to the appropriate computer on your network. Because every device on the Internet must have a registered IP address that isn't a duplicate of any other IP address assigned to another component on the Web, NAT lets you use addresses on your LAN that otherwise wouldn't be available.

Often, routers are used to share a broadband connection because the signal from the modem goes directly to the router. That means all of the computers on the network can simultaneously access the Internet via the router, and no one computer has to be turned on for the others to use the connection.

Combo Equipment

Routers designed for home users contain other networking hardware along with the router, which can be confusing. In theory, a router could have just two ports: one for a connection to your LAN and another for a connection to the Internet. (This port is usually labeled WAN.) In practice, most home network routers also contain integrated hubs or

switched hubs (commonly called switches). These devices have multiple connection ports and are designed to route traffic throughout your internal home network. When a data packet gets to a hub, the hub transmits a copy of the packet to all the computers connected to the hub. This wastes the limited network bandwidth, so we recommend using switches that send packets only to the computer for which they are intended and not to the other computers.

If your ISP (Internet service provider) supplies the hardware for your Internet connection, you may already have a router. Some companies, especially DSL providers, supply customers with equipment that combines a router, switch, and DSL or cable modem all in one unit. If you have trouble, your ISP can provide technical support for most of your networking devices, and you don't have to buy a lot of additional hardware. Most combo routers have two to four Ethernet ports for connecting other PCs or Ethernet-enabled hardware, such as network printers. If you need more ports, most of these devices also have a port labeled Uplink where you can attach a hub or switch.

Break Down The Features

Routers are complex pieces of equipment with many features that are important to understand. We've discussed a few, such as integrated switches, firewalls, and encryption, in the article, but other items on the spec sheet may confuse the uninitiated.

10/100BastT Ethernet—Ethernet is a common LAN (local-area network) architecture used in most home networks. Twisted-pair Ethernet cables that terminate in RJ-45 jacks are used to connect Ethernet components in this sort of network, and they carry data at either 10Mbps (megabits per second) or 100Mbps depending on the speed of the equipment they connect.

DHCP (Dynamic Host Configuration Protocol)—Used by certain routers to assign IP (Internet Protocol) addresses to equipment on your network.

Firmware/Flash Upgradeable—All the settings and special software a router uses are stored in a special flash memory chip (also called firmware). The contents of this chip are not lost when the router is powered down but can be upgraded using special software patches available from the router's manufacturer.

NTP (Network Time Protocol)—Adds special time-stamp data to packet headers and is used to increase security.

PPPoE (Point-to-Point Protocol Over Ethernet)—A protocol that many DSL providers (and some cable modem providers) require.

PPTP (Point-to-Point Tunneling Protocol)—A protocol that many VPNs (virtual private networks) require.

Web-based management—Many routers let users configure settings using a Web-based interface that you access with your Web browser.

Security

Because they serve as the only point of contact between your network and the Internet, routers are the first line of defense against anyone trying to break into your network. Realizing this, many manufacturers build security technology into their routers.

Some manufacturers of home networking routers claim their products have integrated firewalls, but check the specifications to see if it's a true firewall or an NAT. Firewalls actively monitor both incoming and outgoing data to make sure you gave express permission to let data escape from your PC or specifically requested data that's coming in. If unsolicited data tries to make its way to your PC, the firewall blocks it and alerts you. Similarly, firewalls block outgoing data that doesn't have permission to leave and issue another warning. Good hardware firewalls put your PC in "stealth mode," preventing outside computers from probing it for weaknesses. All firewalls use packet filtering to inspect packets, but the best have stateful inspection, which supplements user-defined rules with advanced algorithms that flag suspicious packets based on a history of data requests and packet activity.

Some routers lack built-in hardware firewalls and instead integrate with software firewalls, such as Zone Labs' ZoneAlarm (http://www.zonealarm.com). It's not the same as having a dedicated hardware firewall, but it's sufficient for a home network, and it's better than relying on NAT for security. NAT shields from prying eyes all IP addresses on your side of the router, but a dedicated cracker can circumvent NAT "protection." Always use a real firewall, whether hardware- or software-based, and if your firewall doesn't integrate with your router, install separate software firewalls on each PC on your home network.

Some routers have integrated encryption technology that scrambles all data flowing across the network, so even if someone intercepts it, he likely won't be able to decrypt the data. The best integrated encryption available uses 128-bit or 168-bit keys that are nearly impossible to crack; some routers use older standards with smaller keys. Keep in mind that enabling encryption may cause a slight-to-severe reduction in data transfer speeds depending on the router's manufacturer, the encryption standard, and the transmission conditions.

Because so many people use routers to share a broadband connection, many

manufacturers make products that let users establish individual Internet access rules for each computer connected to the router. Some let you restrict access to certain URLs (uniform resource locators), cut off Internet access at a certain time each day, or prevent certain computers on the network from accessing the Web. These capabilities are known as filtering.

Another security consideration is VPN (virtual private network) support, which establishes a secure connection between your computer and a VPN-enabled computer on the other end. To access your work computer from home, your employer may require a VPN connection to maintain security.

Cut The Cord

The latest trend in routers is wireless. This option is popular for home networks because you can connect computers that are two or three floors apart without stringing cable. It's also nice for notebook users, who can roam the house and out into the yard without losing access to the home network or Internet connection. There are, however, a few caveats. Expense is one; each computer using the wireless connection must have its own wireless NIC (network interface card), which can be 10 times more expensive than wired NICs. Wireless routers also cost more than their wire-bound brethren.

There are speed issues, too. Inexpensive wireless routers designed for home networks use 802.11b Wi-Fi that operate at a maximum speed of 11Mbps (megabits per second), which is 10 times slower than a cheap wired Ethernet connection. Still, this lower speed is more than adequate for sharing an Internet connection; most broadband providers offer connections up to 1.5Mbps. The bad news is when you transfer many large files between computers or transfer a number of smaller files, the transfer takes a lot of time. Newer, faster standards are finally entering the market: The new 802.11a standard is not compatible with 802.11b because it uses a higher frequency, but it supports speeds of as fast as 54Mbps. The 802.11g standard uses the same 2.4GHz band as 802.11b and is backward-compatible with the older standard, but runs at up to 54Mbps. In real-world testing, however, 802.11a and 802.11g equipment rarely exceeds half of its maximum possible speed. Many manufacturers offer dual-mode equipment that supports multiple standards, but using a 802.11b network card with an 802.11a router won't make the 802.11b equipment run any faster.

Most wireless routers have a standard Ethernet hub that operates at 100Mbps for data transfers among all computers connected to the hub. So, you could connect one or two computers to the router using wire and only use the wireless connection for a notebook or a seldom-used computer in another part of the house.

Security is the biggest issue with wireless routers. A router exposes your entire network to the open air, so theoretically anyone with similar wireless equipment could access your network from next door or an adjacent apartment, allowing him to "steal" your broadband connection and surf the

Set Up A Router

Installing a router on your home network is easy, but it takes time and expertise to configure it properly. Here, we'll create a simple network with two PCs, one cable (or DSL [Digital Subscriber Line]) modem, and a wireless router.

Here are the components you'll need:

1 10/100Mbps (megabits per second) Ethernet NIC (network interface card) for Computer 1
1 11Mbps 802.11b Wireless Ethernet Adapter for Computer 2
1 Cable or DSL modem
1 Wireless 802.11b router with integrated switch
2 Cat-5 (Category 5) Ethernet cables

1. Configure The Connection

If you haven't established a broadband connection, sign up for an account and have your ISP configure your cable or DSL modem. Install the 10/100Mbps Ethernet NIC in PC 1 (or use a Wireless Ethernet adapter in both PCs). Connect the PC closest to the cable or DSL modem via a 10/100 NIC card to take advantage of the higher data throughput rates of wired cards.

2. Test The Connection

Use Ethernet cable to connect the cable or DSL modem to the NIC in PC 1 and test the connection to make sure the modem and NIC work properly. If they don't, contact your ISP to troubleshoot.

3. Connect The Router

Turn off PC 1, the cable or DSL modem, and the router. Detach the Ethernet cable from the NIC card in PC 1 and connect it to the router's WAN port. At this point you should have one Ethernet cable going from the modem to the router.

4. Connect PC 1

Plug one end of a different Ethernet cable into one of the switch ports on the back of the router (preferably port #1) and plug the other end into the NIC card installed in PC 1. Turn on the modem, the router, and PC 1.

5. Configure PC 1

Follow the router's instructions to configure your OS to work with the router. Most routers require that you force the PC to automatically grab an IP address from the router, and this procedure varies depending on the version of Windows you use. In Windows 95/98/Me, click Start and Settings, double-click the Control Panel, and double-click the Network icon. Choose the Configuration tab, click the TCP/IP (Transmission Control Protocol/ Internet Protocol) entry to

Web free. Worse, it gives him access to unsecured computers or devices on your network. That means a unscrupulous neighbor can swipe files, snoop around your hard drive, and install software on your computers.

Fortunately, the security problems inherent in wireless connections generally stem from users not properly configuring their wireless routers. For example, most routers have a default security password, and anyone who knows what type of router you have can easily find the password to gain complete access. Change the password, and you've made his job that much tougher. Also, it's very important to enable encryption when using a wireless connection.

Another consideration when going wireless is that the devices don't have an unlimited range or the ability to penetrate an unlimited number of materials, so your results may vary greatly depending on where your computers are and what sits between them. If you've had problems with cordless phones (particularly 2.4GHz models, which is the same frequency that 802.11b uses), you may have trouble with your wireless network signals.

Buying Tips

Now that you know how routers work and what types of equipment are out there, the final step is choosing one that's right for your needs. It is possible to mix and match networking equipment regardless of brand as long as each piece of hardware supports all of the protocols and other features you want, but we recommend sticking with equipment from a single manufacturer if possible. Home networking tends to lead to a lot of tech support calls, especially for those setting things up for the first time, and many manufacturers refuse to support products that you didn't buy from them. It's tough to troubleshoot when the person on the other end of the line is only willing to help with certain portions of an entire network system.

Check with your ISP to make sure that installing a router is OK. If one wasn't provided with your account and the only thing between your computer and the ISP is a DSL or cable modem, the ISP can "see" your computer, which is extremely helpful during troubleshooting calls. Adding a router makes it impossible for your ISP to send diagnostic signals to your NIC card or computer, and many technicians will ask that you connect the line from the modem directly to the computer's NIC card during a troubleshooting session. Also, some ISPs won't let customers share a connection between multiple computers without levying some sort of fee, so be aware that if you run a router without checking the ISP's policies, your ISP may be able to cut off your service if it finds out. DSL companies are generally more lenient than cable providers when it comes to routers (in fact, many DSL providers encourage the practice), but it pays to know your ISP's policy. ■

BY TRACY BAKER

This is the back of a cable modem. The gray cable normally would go to the computer's Ethernet card, but when you install a router, the other end of the cable connects to the router's WAN (wide-area network) port.

highlight it, and click Properties. Choose the IP address tab and click Obtain An IP Address Automatically. Click OK and restart the PC.

In Windows XP, click Start, Control Panel, and Switch To Classic View (if available) and open Network And Internet Connections. Right-click Local Area Connection and click Properties, then the Internet Protocol (TCP/IP) entry, and Properties. Choose the General tab and select the Obtain An IP Address Automatically radio button. Click OK and restart the PC.

6. Configure The Router

Use the router's documentation to access and modify its settings. This step varies widely from router to router, and you may have to contact your ISP to get some required information, such as the Domain Name or Host Name your connection uses. Visit the router manufacturer's Web site and download the latest firmware upgrades for the device. If any are available, follow the instructions at the site to upgrade the router's flash memory, adding new features and fixing bugs.

Also enable the router's security features, such as encryption, at this time and turn on its wireless transmitter (if applicable).

7. Configure PC 2

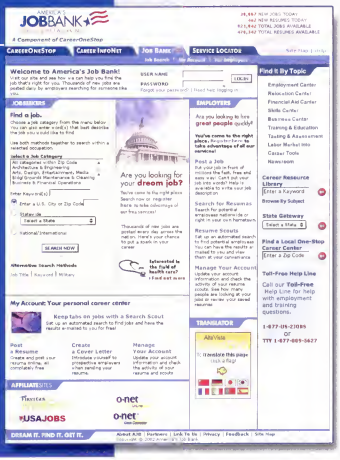
Install the wireless Ethernet adapter on PC 2 using the instructions and drivers included with the device. Also, visit the manufacturer's Web site to check for new drivers. Refer to the tips in Step 5 to finish configuring PC 2. After you reboot your computer, you should be able to access the Internet wirelessly even if PC 1 is turned off. Most wireless Ethernet adapters also come with signal strength meters or software that tells you if a bad or weak signal is responsible for speed or other problems.

You can add more computers to the network by physically attaching them to the other Ethernet ports on the router's switch or via another wireless Ethernet adapter.

jobsearch.org

Appeal To A Hire Power

Employment Is Job One At America's Job Bank



One of the many ways in which the Internet has affected our lives has been the widening of what might be called our sphere of local influence. Take the old institution of the classified ads. Ten years ago, if you had something to sell, your market was pretty well limited to the subscribers of your daily newspaper. Now, thanks to eBay and other sites, the entire world has opened up as your marketplace.

For job seekers and employers, the Internet's advantages are obvious. No matter which camp you fall into, your options are no longer restricted to a 30- or 40-mile radius of networking, employment agencies, and help-wanted ads. During the past several years, employment-oriented Web sites have sprung up to broaden the search base, but in most cases, they're subject to the same concerns as other dot-com ventures. At some point, they must turn a profit to stay in business, which means their bottom line is more important than your employment needs.

This isn't the case with America's Job Bank (http://www.jobsearch.org). Rather than getting the green light from venture capitalists who expect their investment back with interest, AJB (America's Job Bank) receives its funding from a nonprofit alliance between federal and state government agencies. Whether you're unemployed or underemployed, looking for a career change, or hoping to add someone to your payroll, this is one Web site that can help without expecting anything from you in return.

A Million Jobs, No Lines

When you first arrive at AJB, you'll see from the tabbed layout that it's actually part of a four-site suite providing job listings, employment services, career information, and more. You must first register for an account to use the site's features.

Turn your attention to the box in the middle of the home page; its headline asks, "Are you looking for your dream job?" Click the Register Here link and take a moment to read the Code Of Conduct And Privacy Policy before clicking the I Accept button. It does contain important information.

As you continue, you'll need to provide more personal data than you do for most Web sites, but this site isn't for entertainment purposes. There's one area on the first page of entry fields that may at first appear poorly designed, but it works fine: Under Current Occupation, when you click the Select Job Title button, it will cycle you through a couple pages of category breakdowns and then deposit you back where you started, so don't worry about losing your place. Next, you'll mark your military veteran status; there's also a Confidential Information page (gender, race, Social Security number, etc.) that is entirely optional. Finally, you'll need to establish a username and password.

When you finish, you'll be registered for all four affiliated sites and eligible for services nationwide, although your account is focused on your home state. On return trips, just log in at the top of the home page.

The moment you finish registering and whenever you log in, you'll arrive at your personal (and secure) Account Page. It packs a ton

of options into a small space, so it's possible to do most or all of your work from here. To access various tools, use the blue navigation bar on the left side. The rest of the page displays three lists: jobs you're watching, resumes you've written (or are working on), and Job Scouts (an automated search tool) you've created.

Although your main Account Page keeps track of these items in one consolidated table, you can call up a more detailed and interactive version of each list by clicking its associated button in the navigation bar. For example, the My Jobs link adds a Location column to the other data.

Write a resume. All job hunts begin with this indispensable tool. When you click the Resume Builder button, the site walks you through six steps to help summarize your employment interests, educational and job history, willingness to commute, and so on. If you need a helpful nudge when drafting particular items, click the Sample link beside the entry field; a pop-up window will show you an example. At Step 6, you can tailor your resume's appearance by selecting various options for style, structure, and colors.

Writing a resume can be time-consuming; fortunately, you can save your work at any stage and continue it later. When you're ready to save the finished product, click the Activate checkbox to make your resume available to potential employers conducting their own searches for qualified applicants. You can also prepare and save multiple resumes, targeting them for different career directions, although you can have only one resume Active at a time.

Add a cover letter. By clicking the Cover Letters button, you can compose and archive as many as five letters to include with your resume. This is good news if you're doing multiple resumes and want to introduce yourself in a manner appropriate for each career direction. Note that your letters are stored here, as well as created, rather than on your Account Page master list.

Seek & You Shall Find

Once you have your presentation tools in order, start pounding the virtual pavement. You can do so from the page notifying you that your completed resume has been entered into your state's job bank; click the Search For Jobs button. On subsequent visits to the site, you can search in two basic ways.

Manual search. To find what's available, click the Search Jobs button in the My Jobs list on your Account Page. This provides you with a single-page form from which you'll select a job category and/or any keywords to look for and then designate a geographical region to search. This can be as narrow as your ZIP code, or statewide, or even nationwide. Once your terms are set, click Search Now.

The results display as a table showing the job title, employer, location, salary, and when the listing was posted. Read the fine print because there's plenty you can do to further sort the results, save your search criteria, and so on.

To see details for a position, click its Job Title. This opens a page listing everything you may need to determine if it grabs your interest: job summary, description, and benefits. (If you're drawn to an employer rather than the job you've found, click the company name for a list of what's available.)

Now, you can scroll to the bottom of the page to take action. If you need time to think, click Add To My Jobs, which will place a direct link to the listing on your Account Page. If you know this is the job for you, you can try clicking the Apply Now button, which in theory is supposed to furnish contact information, but be forewarned that we often found this to be a dead end. If so, you may have to return to the Description section of the Job Details page and follow the instructions there.

Tips For Using America's Job Bank

Study the application process. Employers all have their own ways of doing things and their own preferences for application methods; some allow it online, others don't. Because we lack the space to cover every contact scenario, we recommend that you click the Help link in the blue bar across the top of most pages. In the new window, click the Index button and select Applying For Job.

List your links. America's Job Bank lets you create your own on-site list of site links. For example, you may want to consolidate bookmarks for the Human Resources departments on the Web sites of companies to which you're applying or link to an off-site resume guide you like. To add a site to your list, click the Personal Links button on your Account Page navigation bar and then the Add Link button. Although you have to input the site's name and address manually, you may find it a handier location than jumbled in with everything else under your browser's Favorites list.

Update your data. Because you've furnished more personal information than usual, there's a greater chance you may need to change some of it before you hit retirement age. To update anything, click Account Info in the navigation bar.

Don't budge from your Account Page. If you're doing much skipping around between your Account Page and its spinoffs, try launching each new direction in its own window. We encountered an annoying bug in the works that would randomly prevent us from using our browser's back arrow to return to our Account Page, forcing us to log in from the home page all over again. Whether you're using Explorer or Navigator, right-click the desired link and select Open In New Window from the pop-up menu.

Job Scout search. Think of a Job Scout as your very own robot that you can wind up and send off to sniff out potential jobs that meet all of your qualifications and criteria. The Scout will then notify you about what it finds.

To create your very own Job Scout, click the New Job Scout button on your Account Page. Basically, this automates the manual process we've just described. The only difference is that you'll need to name the Scout and use a drop-down menu to set its operating schedule, with your choice of 10 intervals, from once per day to once a month . . . or never, if you prefer to let it idle.

When it finds a match after running a scheduled search, your Scout sends you the results via email. You can also operate your Scout at will by first selecting it in your standalone Job Scouts list and then clicking the Run Scout button; this is simply a shortcut to the manual search, using your preconfigured terms.

You can employ up to 10 Scouts, each targeted toward different job categories and geographical areas. Unlike multiple resumes, they can all be Active at the same time.

For Employers Only

Even if you're looking to hire rather than get hired, most of the features we've described apply to you, as well. You'll start from the Employers box on the home page and register your company for an account. One significant difference is that you'll need to furnish benefits information. And, of course, you'll be able to post as many jobs as you have open rather than maintain one active resume at a time.

In general, the resources are similar. Employers can conduct manual searches for qualified employees and create Resume Scouts to automate the legwork on a fixed schedule.

Your personal Account Page gives you a consolidated interface that handles everything from writing and saving resumes to conducting job searches.

Additional Resources

AJB packs a library's worth of information in the home page's Find By Topic section. You can input your state or ZIP code to identify local service agencies or click a subject heading to explore a vast wealth of resources. For example, in the Financial Aid Center, you can obtain help calculating and budgeting educational or training costs, explore loan and scholarship options, and much more. If you're thinking of moving, check the Relocation Center to get cost-of-living data for your new destination.

As you click these resources, look at the main navigation tabs and you'll see that you're now moving on to the affiliated sites. Here's the main focus of the other three:

CareerOneStop. This is actually the parent site for the full suite; it provides tips for employees and employers on getting the most out of everything, such as how to write better resumes and ads. There's also a strong educational, training, and self-assessment component.

Career InfoNet. Here you'll find data on employment trends, such as the fastest-growing occupations, and demographic data, such as statistics on unemployment, wages, and average household income.

Service Locator. Because AJB brings together job information and resources from all 50 states, here you can pinpoint the local service agencies closest to where you live and learn what they can do for you. ‖

BY BRIAN HODGE

America's Job Bank Fact Sheet

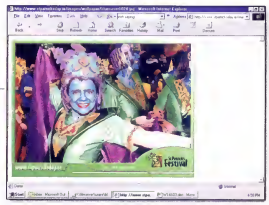
America's Job Bank was founded on Veteran's Day in 1993 as an expansion of the Interstate Job Bank. When it went online in February 1995 with Jobsearch.org, AJB began adding access to the job banks of the individual states, making it the world's largest electronic job database.

As a partnership between the federally funded U.S. Department of Labor and State Workforce Development Agencies, AJB consolidates listings from not only all 50 states, but also from the District of Columbia, Puerto Rico, and the Virgin Islands. This cooperative arrangement lets AJB be national in scope, yet local in its depth. The American public has access to the full range of employment opportunities in the country . . . from cowboy to corporate executive, from forest ranger to NASA engineer. The database is constantly updated as employers (both private sector and governmental) post job listings directly through the Internet, as well as through local employment agencies.

Of course, the number of available jobs at any given moment fluctuates with the times. You can check the current total in the upper-right corner of the home page. As we go to press, the figure has been hovering around 900,000. At its peak in late 2000, however, the total was nearly 2 million.

Web Tips

Enhance Your Time Online



Even if you can't make it to Dublin this year for St. Patrick's Day, you can still imbibe in a little Irish magic at the St. Patrick's Festival Web site.

Beannachtam na Feile Padraig!

Some of us refer to it as "The Homeland." Others the "Green Isle." By any name, Ireland is a magical land steeped in beauty, violence, sorrow, and pride. No day commemorates all things Irish like St. Patrick's Day. This St. Patty's Day, march your browser to St. Patrick's Festival (http://www.stpatricksday.ie/cms) for a rundown of the events planned in Dublin for March 11 through 17. If you can't take part in the festivities, download an ecard or wallpaper for a smaller dose of Irish magic. Hover your mouse pointer over the Fun Stuff link on the home page's left side and click the appropriate link. If a stroll across an authentic, rolling Ireland hill is in your future, check out Ireland.com (http://www.ireland.com). Near the home page's top right is a "Take me to . . ." drop-down menu. Click the down arrow, scroll to Explore Ireland, and click Go. The next page provides an interactive County Guide, featuring a bounty of info on just what makes Ireland's natives, cultures, land, and more so alluring.

The MO On VCD

One day, burning your own DVDs may be as common as downloading music from the Internet to make your own CDs. For now, however, DVD drives are still expensive and the various DVD standards aren't compatible with one another, meaning a DVD player may not play back a disc burned on a drive that supports a competing format. Enter VCD (Video CD). VCDs typically store about 75 minutes of audio and video on a 650MB disc. VCD quality is great (about that of a VHS tape), but the quality won't deteriorate over time, and nearly all DVD players support the VCD format. SVCD (Super VCD) has better quality, and most DVD players support it. For more information on creating your own VCDs and more, check out VCDHelp, SVCDHelp & DVDRHelp.com (http://www.vcdhelp.com). Go to the NEWBIE link on the main page for excellent how-to guides, definitions, articles, and more info tailored specifically to those new to creating VCDs and SVCDs and general DVD use.

You Have The Power . . . Now Use It

What's the point of owning a beefed-up $500 PDA (personal digital assistant) if you use it only to jot down minutes at the monthly PTA meeting or add "bread" to your grocery list? Put some brain behind that brawn with the Software Directory at HandheldNews.com (http://www.handheldnews.com). On the home page, click the Software Directory link to access a large selection of freeware and shareware apps covering Applications, Calculators, Database, Financial, Internet, Music, Wireless/Palm VII, and more. Click a category to see a list of related apps. Most applications include links to the developer/publishers' sites; you'll also see a Details link that lists an app's price, file name and size, and features.

Bound For Snow

As most of us know, when Old Man Winter gets grumpy, he vents his considerable wrath in the form of driving snow, freezing sleet, or arctic winds whipping where it hurts. For all his polar posturing, the old man isn't all bad. After all, few things beat a glide down the powdery loads of white gold dumped on our favorite ski resort. To keep tabs on the conditions, check out MySnowReport (http://mysnowreport.com). On the main page, you'll see drop-down menus for U.S. regions and Canadian provinces. You can get a report that other skiers and snowboarders provide. More convenient are the personalized reports the site provides based on a profile you create (after registering). You can access the reports via the Web (including wirelessly), email, or text-based messages sent to your mobile phone.

Translate Terrorism

Terrorist groups have been bloodying the planet for centuries, but not until Sept. 11, 2001, did most Americans confront the violent realities of terrorism. Pundits have long tried to make sense of the motivations and workings of al-Qaeda, the IRA, Hamas, and even American eco-terrorists, but the Terrorism: Questions & Answers Web site (http://cfrterrorism.org/home), operated by the nonpartisan Council on Foreign Relations, makes more sense of this topic than most. The site uses a plain-English, even-keeled approach to present well-written reports packed with facts, theories, and related sources on topics in categories such as What Is Terrorism, Havens For Terrorism, Coalition States, Homeland Security, and Policy After 9/11. Information is organized in a Q&A format that works quite well. For synopses of the major terrorist groups operating today, start with the Terrorist Groups link on the left side of the main page.

find it online

Compiled by Joshua Gulick

Surf The Universe

Alien-UFOs.com

http://www.alien-ufos.com

Are you an expert in the field of UFOlogy? Neither are we, so we turned to a site that offers the latest news on what the little green men are up to. The main page links to reports on possible alien activity and photos of suspected flying objects. You can participate in alien-related polls, read about propulsion theories, or search photos of crop circles for clues to another species. If you have your own Web site about aliens or UFOs, you can submit your site to win the Alien-UFOs.com Award Of Excellence.

Ask The Space Scientist

http://image.gsfc.nasa.gov/poetry/ask/askmag.html

Have you ever wondered what's on the other side of space? If so, you're not alone. More than 2,400 people have read the Space Scientist's (professional astronomer Dr. Sten Odenwald) answer to that question. The Web site's FAQ answers questions such as, "What is on the other side of a black hole?" Browse through a list of common astronomy misunderstandings and clarifications. If you have a space-related question the Space Scientist hasn't already answered, you can click the email link for instructions on how to email your question.

Bad Astronomy

http://www.badastronomy.com

Misconceptions abound in the field of astronomy. Bad Astronomy creator Phil Plait takes on the formidable task of debunking myths, such as the Moon Hoax (a theory that NASA faked the first moon landing), with facts and humor. The Web site explains misconceptions in plain English and includes links to mathematical calculations when necessary. If you read Plait's descriptions of mistakes in sci-fi movies, you can read brief descriptions that won't spoil the movie or read thorough explanations if you have already seen (or don't intend to see) the movie.

KidsAstronomy.com

http://www.kidsastronomy.com

If your child's current career plan involves a space shuttle, send her to the Planetary Society's Web site. Kids can enter in KidsAstronomy.com's science contest before March 31, 2003, by submitting science-related art, essays, photos, or science projects. The Space section has detailed, kid-friendly information on topics such as The Solar System and Space Exploration. The Web site includes a large games section; your child can play everything from educational games, such as the space-themed Word Search, to games that are just plain fun, such as the Space Lib and Bop It (Whack-A-Mole with a martian twist). She can also download free space wallpaper for her Desktop or send ecards to her friends.

Astronomy Picture Of The Day

http://antwrp.gsfc.nasa.gov/apod/astropix.html

You won't have to guess what you're seeing when you visit Astronomy Picture Of The Day. Two professional astronomers include a detailed description with the daily picture, complete with links to other sources. The astronomers link to any relevant information, so don't be surprised if a link takes you to a poem about the star in the photo. If a single picture isn't enough, you can search the archives for previous photos. Astronomy Picture Of The Day publishes pictures from NASA and user submissions.

The Planetary Society

http://www.planetary.org

If you like space gadgets, take a look at the Planetary Society's Web site. You can design your own Lego Red Rover and submit the design instructions and a photo of your rover to The Planetary Society. The Web site displays user-submitted pictures of the planet-roaming rovers and lets you control one of the Planetary Society's rovers over the Internet. You can also learn about the Solar Sail, a spacecraft that will use the sun to travel. You can read about the latest tests and sign up for email updates on the Solar Sail's progress.

The Astronomer Online

http://www.theastronomer.org

If you are an amateur astronomer and think you've found a new supernova, take a picture and submit it to The Astronomer Online. Amateur and advanced amateur astronomers can gain recognition by letting the magazine's Web site publish their pictures of the skies. If you'd rather see the pictures than take them yourself, click one of the links on the left side of the main page to view Gamma Ray Bursts, Novae, Meteors, Planets, and other space inhabitants (sorry, no aliens or UFOs). The Web site also offers instructions for ordering sample copies or a subscription to the print magazine.

Finding the appropriate Usenet discussion group to match your interests can be a monumental task. So each month, we scour tens of thousands of newsgroups and highlight ones that delve into popular topics. If your ISP (Internet service provider) doesn't carry these groups, ask it to add the groups to its list. This month, we aim our telescopes at Usenet's space enthusiasts.

sci.space.history

Was that a shooting star or a Russian satellite booster re-entering the Earth's atmosphere? Visit sci.space .history if you have questions about space, want to learn about space exploration history, or have information you would like to share. Users range from casual Usenet readers to space exploration enthusiasts who contribute often. The users who post regularly often answer basic questions or post questions of their own on topics, such as female cosmonauts, the Apollo missions, and recent space-related books.

sci.astro.amateur

You don't need the Hubble telescope to find some amazing sights in the night sky. If you scan the stars with a telescope in your backyard, you have enough experience to fit in with the readers at sci.astro.amateur. Casual astronomers trade tips on topics such as making charts and buying telescope eyepieces. You can also find long threads discussing relationships between religion and science. If you are interested in finding out what researchers using the Hubble telescope are watching, you can read daily reports at sci.astro.hubble.

Share The Wares

Some of the best apples in the online orchard are the free (or free to try) programs available for download. Each month we feature highlights from our pickings. This month we open our ears, boot up our computers, and listen.

Watch SETI@home search recordings from the Arecibo telescope for alien communications.

SETI@home

http://setiathome.berkeley.edu

If you think sentient life forms on another planet are sending us signals, you and your computer can help Earth get the message. SETI@home (The Search For Extraterrestrial Intelligence) is an example of the type of massive computing project known as distributed computing.

Here's how it works: The Arecibo research facility in Puerto Rico records signals from space with an advanced telescope. The Arecibo research facility sends the tapes to the SETI project team at the University of California, Berkeley, which begins to filter the noise on the tape, looking for a radio signal from another world. The task is complex and requires more processing power than the university has available, so the SETI team borrows processor power from SETI@home members (membership and the software is free). The SETI team breaks down the data into small chunks and sends one of the chunks to your computer. Your computer uses the SETI@home software to analyze the data and send the information back to the university. (You don't need to be online when your computer filters the data, but you will need to connect to the Internet to send back the filtered unit and receive a new one.) The SETI team organizes the returned data and determines whether you've caught an alien's signal.

Unless you change the default configuration, the SETI@home software runs only when you are not using your computer, so SETI@home doesn't interfere with your work; it uses processor time that would otherwise be wasted. It acts as a screen saver and displays your search results on your screen. You can watch the graphs for spikes (which might be alien signals). You can also visit the Web site to get the latest news on SETI@home's progress and view member profiles. SETI@Home runs on Win95/98/NT/2000/XP and Mac OS X. A version without a GUI (graphical user interface) is available for several other OSes (operating systems).

room to burn

VINYL
DIGITAL VIDEO
DATA BACKUP
ORIGINAL MUSIC
DIGITAL PHOTO
MP3

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Picture This!

Digital Cameras Improve Their Images

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Noah Kalina may be the future of photography. A 22-year-old professional freelance photographer, he shoots digital for fun and for his job at AOL Digital Cities. Like millions of professional and weekend photographers, he's been seduced by the instant-gratification thrill of digital cameras.

"It's just so nice to have my results right here, shoot a ton and not worry about what the lab's going to do," Kalina says.

So it's no wonder more and more people are taking to digital photography. More than 9 million digital cameras were sold in 2002, according to IDC analyst Chris Chute. That's a 50% growth over 2001, and Chute expects the sales to expand by the same percentage in 2003.

In the past, digital images haven't quite matched film quality. But the increasing popularity of digital processing machines at local photo shops, six-color home inkjet printers, and 4-plus megapixel cameras may make 2003 the year digital finally gives film a run for its money.

"I think the consumer cameras are getting to a point now where you can get a 4 x 6 that is almost equivalent to 35mm film," says James Ramer, associate chair of photography at the Parsons School of Design, a top art school in New York.

Digital cameras work much like film cameras: They have a lens that focuses light onto a receptor. In a film camera, that receptor is film, and once the film is exposed, the camera moves new film into view of the lens. Film is an analog, continuous-tone medium, which can capture an infinite number of possible levels of black, white, red, green, and blue.

All consumer digital cameras rely on CCD (charge-coupled device) chips to replace film. CCD chips react to light, sending back digital signals representing levels of red, green, and blue. Processors in the camera then analyze the image absorbed by the CCD, balance the colors, compress it, and write it to a storage device.

Advances in CCD technology have driven consumer digital camera resolutions from the 0.3 megapixels of the original Apple QuickTake in 1994 to today's 5-megapixel cameras, such as the Olympus C-50.

So how many megapixels is good enough? Parsons teaches photographers to think of images at 300dpi (dots per inch). To figure out the ideal largest size for a digital photo, take the maximum dimensions in pixels and divide by 300. A 2-megapixel camera, for instance, captures images at 1,600 x 1,200 pixels. Divide by 300 and you get a 5.3-inch x 4-inch print.

But Mike Duggal, chief operating officer of Duggal Visual Solutions, New York's premier photo lab, says you can still get good prints at 200dpi; that's an 8 x 6 print on your 2-megapixel camera. (See the "How Many Megapixels?" chart.) And if you're shooting for the Web or email, you need no higher than 72dpi, the resolution of your screen. So your 2-megapixel camera could make a 22 x 16 image for the Web.

Kalina has been doing a self-portrait project consisting entirely of 640 x 480 photos: a resolution available on even the cheapest cameras. That resolution won't make big, glossy prints, but for screen display, it's just fine.

Now, most consumers are finding their sweet spots at 2 megapixels. More than 40% of all digital cameras sold in October 2002 were 2-megapixel models, according to research firm NPD Intelect. But the fastest growing segment is 4-megapixel cameras, which jumped from 6% of the cameras sold in January 2002 to 16% of those sold in October 2002.

Why get a mega-megapixel camera if you mostly print 4 x 6 images? Cropping is one major reason. With a 4-megapixel camera, you can take a good chunk out of a photo and still have enough pixels for a professional-quality print.

Shoot A Moving Target

CCDs were originally developed for video cameras, and the first commercial digital still camera, the Sony Mavica from 1981, was actually just a video camera that shot freeze-frames. But video and still cameras aren't interchangeable, yet. Many still cameras can shoot a few seconds of relatively low-resolution video, fine for Web clips but not the sort of thing you'd want to put on tape or DVD. Higher-end digital video cameras, meanwhile, can shoot 1-megapixel to 1.3-megapixel still images, which is fine for the Web and email, but a bit short of what you'd want to paste into a photo album, and lower-quality than a $200 dedicated digital still camera.

"Just as camcorders are optimized for taking continuous moving video, digital still cameras are optimized for taking still pictures," says Greg Young, general manager of Sony Electronics' digital imaging division.

But video stills have their uses. Kalina is actually using a Sony video camera for his 640 x 480 project, for instance. For self-portraits, video cameras offer one compelling benefit: "The screen flips around so you can see yourself," says Kalina.

The two products may come together in a few years, Young says. For now, think of shooting stills on your video camera as a bonus.

"Just as cell phones may have cameras . . . as options . . . but are primarily designed for communications, still cameras will remain for the next few years far better at stills than video cameras, and vice versa," Young says.

camera will work better in low light and deliver images with less noise.

"If you look at the measurement of the individual pixel on a [professional] Canon D60, it's 7.4 microns. The [consumer] G series is generally 3 microns. A larger pixel gives it more of an opportunity to collect light," says Chuck Westfall, technical information manager for Canon's camera division.

of those: three-color, four-color and six-color. More colors means better contrast and a closer approximation of continuous-tone photography.

"For photographic printing, six colors is the way to go," Knauer says. The paper you're printing on also matters. The inks on plain papers tend to bleed, Knauer says. Photo papers are coated to keep ink where it belongs.

Through A Lens, Digitally

More megapixels mean a better image, up to a point. But once you get into the lofty realms of today's digital cameras, other factors come into play.

Take lenses, for instance. Improving the quality of the light reaching the CCD is one way to make a better picture with the same number of megapixels. So on higher-end cameras, manufacturers use aspherical lenses, which fix the tendency of lenses to be sharper in the center than at the edges of a picture. They use extraordinary dispersion glass, which balances colors. And they use low f-stop lenses, which let in more light and are often ground to produce sharper images.

With 4 x 6 prints, it's almost impossible to tell the difference between 3-, 5-, and 6-megapixel shots. This picture of the AOL Time Warner Center in New York City has a lot of fine white lines, where you can often see pixelation, but the differences among the shots are subtle at best.

"Often people undersell or don't recognize the value of optics," says Phil Scott, worldwide product manager for Kodak's consumer digital cameras.

Olympus has two 5-megapixel cameras: the C-50 and the C-5050. The less expensive C-50 features an F2.8 lens, where the C-5050's lens goes down to F1.8. That and other differences make for a clearer picture.

"A lower f-stop is a mark of a little bit better lens, usually," says John Knauer, senior product manager for the computer products group at Olympus.

CCD size affects photo quality, as well. Most consumer cameras have 1/3 inch CCDs, but higher-end cameras feature 2/3 inch or even larger CCDs. If the pixels are larger on a CCD, a

Digital photographers should also pay attention to file types, Ramer says. To save space on memory cards, most cameras save photos in the compressed JPEG (Joint Photographic Experts Group) format. That's fine for most uses, but if you want to blow up your photos to 8 x 10 or store them in archival quality, you should make sure your camera has the option to use uncompressed TIFF (Tagged Image File Format) or RAW modes (uncompressed images; the files are large, but they're also the best quality), he says.

Garbage Out . . .

No matter how crystalline your lens is and how vast your CCD, a picture is also only as good as its printer. The vast majority of digital prints are made on home inkjet printers, Chute says. And there are currently three varieties

"We could probably sit around with eight people who have eight choices of papers and have an argument about which one's best," Knauer says.

The best prints come from professional machines that use a laser to expose digital images on real photo paper. For professional results, Duggal recommends going to a lab with Agfa D-Lab 2, Lightjet, or Lambda equipment. "You're going to get a much truer color match and it'll last a lot longer than the ink jet prints people have at home," he says.

Beyond image quality, there are other features to look for when choosing a digital camera.

Zoom lenses are great, but look at only the optical zoom number, which measures the power of the zoom lens. Digital zoom is a merely a computer trick that will ultimately lower the quality of the image.

For snapshot photographers who don't want to worry about white balance and exposure correction, a wide range of preset modes (such as night shot, landscape, and indoor) is a boon; conversely, hobbyists should look for a camera with manual settings.

You can improve low-light situations with a camera with high ISO sensitivity. Although most digital cameras have about the light sensitivity of outdoor film (ISO 100 to 200), a few, such as Sony's DSC-F717, can push their CCDs up to the equivalent of ISO 800.

Finally, there's a wide range of memory cards used by cameras. SmartMedia and CompactFlash are the cheapest at large sizes. Secure Digital cards let you view your pictures on many handheld computers. CompactFlash and the new XD format have the most potential for growth; CompactFlash cards already come in 1GB size and XD manufacturers promise chips up to 8GB in the future. Don't let your media choice sway your camera purchase, manufacturers say, because all media have about the same performance levels.

Without fine lines, type, or other tiny details for the eye to fix upon, it's very difficult to tell the difference between 3-, 5-, and 6-megapixel photos of this tree in New York's Central Park. Even blown up, the blending patches of color in this image will make it difficult to find pixelation.

A One, Two, Three, Four . . .

We put the latest generation of digital cameras to the test by toting six cameras around New York City: Sony's 1-megapixel U10 ($199), Olympus' 3-megapixel D-550 ($299) and 5-megapixel C-50 ($599) and C-5050 ($799), Nikon's 6-megapixel D-100 ($1,850), and an inexpensive Olympus Stylus 100 film camera ($199).

The good news for digital: When printed at a professional photo lab, we were hard-pressed to tell analog from digital images. Even the 1-megapixel Sony looked pretty good at first glance, although narrow white lines and lettering get a case of the jaggies.

In fact, we liked the 5-megapixel and 6-megapixel digital images *better* than the film images; they were taken with cameras with better autofocus, better lenses, and better light metering than our Stylus 100. And all the high-end cameras more than maxed out the capabilities of the 400dpi Agfa D-Lab 2 they were printed on. According to Duggal, that's the best digital snapshot printer available.

The differences between the 3-megapixel and the 5-megapixel images were visible in a photo of a bookshelf; with the higher-resolution camera, the titles were more readable. (Even the 3-megapixel image was more legible than the film camera.) Photos of trees and buildings were indistinguishable until blown up several times.

The C-5050 has the same number of megapixels as the C-50, so you'd expect it to turn out the same images. Wrong. The C-5050 uses a higher-quality lens than its smaller cousin, resulting in less muddy images, especially when you blow them up to absurd extents.

So what do you get for the $1,850 street price of the D-100? (That doesn't even include a lens!) The D-100 produced gorgeous, razor-sharp images, even when we blew up the images. More importantly for hobbyists and professionals, there's a precise manual focus, removable lenses, shutter speeds

How Many Megapixels?

The chart below shows what image size works best for various formats, such as pictures on your Web site or 5 x 7 prints. For instance, if you're planning to post your photos to your Web site, you probably don't need to invest in an expensive 3-megapixel or higher camera.

Megapixels	Image Size	Best Quality For
<1	640 x 480	Web, email
1	1,280 x 960	4 x 6 prints at home
2	1,600 x 1,200	4 x 6 prints
3	2,048 x 1,536	5 x 7 prints
4	2,272 x 1,704	8 x 10 prints at home
5	+2,560 x 1,920 or more	Large professional prints

up to 1/4000 of a second, negligible shutter delay, and vastly better low-light abilities, up to the equivalent of 1600 ISO film. The D-100 is overkill for consumers, but it's not farfetched to think that its image quality may come to consumer cameras within a few years.

The difference between high-resolution cameras shows up clearly when you blow images up to poster-level sizes. Here, the 3-megapixel image of the AOL Time Warner Center suffers in comparison to the 5- and 6-megapixel shots.

There are still some ways in which digital cameras don't quite match film. One is low-light performance, and a second is speed.

If you like to shoot indoors without a flash or shoot in low light at high speeds, you may find digital photography frustrating. Consumer CCDs are at best the equivalent of outdoor (ISO 200) film, experts say. Pro-grade cameras let you push the CCD to an ISO of 1200 or even 1600, at the cost of a slightly noisy image.

"CCDs are inherently less sensitive to optical wavelengths of light than film is," says Jim Pohlman, Kodak's director of operations for intellectual property.

Shutter delay has always been another bane of digital cameras. There are three elements to shutter delay: the camera's startup time, autofocus time, and processing time. Slow startup is the price you pay for having tiny zoom cameras that need to extend their lenses when they're opened, Scott says. You can minimize the autofocus delay by prefocusing or holding the shutter button down halfway to lock in the focus. And processing time? That's a problem you'll have to throw money at. The Nikon D-100 feels much snappier than cheaper consumer cameras, for instance.

"To increase your speed, you need faster, better processors, which add cost," Scott says.

There's one other thing that can help fight processing lag. Many high-end consumer cameras, such as Kodak's LS443, now include RAM buffers that let you take three shots in a row and then process them all at once.

Say Goodbye To Film

Digital cameras have come a long way since 1994. They've taken photojournalism by storm, as shutterbugs on deadline no longer have to worry about processing their film. They've enlivened countless personal Web pages and freed innumerable weekend photographers from the constraints of 36-shot rolls.

Nevertheless, Knauer doesn't think digital photography will completely replace film. Photography is an art that's not just about image resolution, and images shot with different technologies have different feels. "If you look at a shot that was done on a glass plate at the turn of the century, there are certain things that are unique to glass plate photography," he says. "Digital isn't an exact replacement for film in the way it looks."

Kalina sees a different future. Once super high-resolution digital cameras become affordable, he says, there will be no going back. "I really don't think there's going to be any reason to shoot film any more," he says. ■

BY SASCHA SEGAN

When Does Digital Match Film?

High-end professional digital cameras already match or exceed the image quality of film, experts say. But where to draw the line is tricky, as the analog, continuous-tone nature of film can't easily be translated into pixels.

A handheld, 35mm film camera has about the equivalent of a 6-megapixel resolution, says Knauer. Stabilize that same camera on a tripod, and you'll get about 8.6 megapixels; meanwhile, because of lens design, film images are sharper at the center than they are around the edges.

So looking at things one way, professional digital cameras, such as Canon's EOS-D1s and Kodak's DCS-14n, at 11.1 megapixels and 14 megapixels respectively, have blown through the film barrier. A slew of more affordable professional digital cameras, such as Nikon's D-100 at 6.1 megapixels, are hovering around the quality of film.

But there's another way to look at image quality. Mike Duggal says as long as your image is 300dpi, you'll come very close to film. For 4 x 6 prints, that means a 3-megapixel camera will more than give film a run for its money. For 8 x 10s, photographers may seek cameras of 5 or more megapixels. ■

Picture Perfect

Coax Better Photos From Your Digital Camera

For a technology that originated in the mid-19th century, photography has made a smooth transition into the 21st. Even if they haven't driven their film-based counterparts into retirement, digital cameras are rapidly catching up in terms of quality and offer some unique advantages of their own.

But bringing evolutionary developments to any longstanding technology usually calls for new ways of getting the most out of it. With digital photography, refining your skills means taking techniques that have been in use for many decades and combining them with features that George Eastman could never have foreseen in his lifetime.

On The Other Hand

Unless you've invested several hundred dollars in a digital camera, you may discover it doesn't offer the manual control you're accustomed to seeing on a standard-issue 35mm model. If a lower price was a factor in your purchase, what you bought probably falls somewhere between a traditional full-featured camera and a point-and-click Instamatic. It may lack shutter speed control. It may not have an f-stop or equivalent control so you can open and close the aperture at will.

Digital cameras usually compensate with automation, making picture taking more convenient and foolproof, especially for novices. With its sensor mechanisms, your camera may autofocus in a split second, optimize the shutter and aperture settings for each situation, and detect whether it needs the flash.

Just the same, you can override this automation to an extent. For example, choosing from various white balance presets (sunny, cloudy, fluorescent) will take the guesswork out of making allowances for your lighting source.

You'll also want to understand the EV (exposure value) settings in order to compensate for lighting conditions that trick your camera into performing less than its best. These might include the presence of glaring reflective surfaces, such as water, or well-lit scenes in which your subject alone is slightly darkened. Positive EV values (+1EV and higher) induce overexposure, for when extra light is needed. Negative values (–1EV and lower) induce underexposure, which is useful when you have more light than you need.

Moving up the price scale, some cameras offer Priority Modes for shutter and aperture settings. With these modes activated, you can manually set one control, such as the aperture, while the camera automates the other.

Regardless of your camera's price, you'll get your best results if you take time to learn what it can and cannot do and take enough test shots to understand its behavior. Even with the limitations of an affordable digital camera, you can accomplish a lot.

The Anatomy Of An Image

As a novice photographer, you may look at the world the way you always have . . . that is, taking it all in at once. Although the average viewer may not consciously realize it, good photographs are the product of several distinct elements. When these elements all work in concert, the photograph becomes far more than simply the sum of its parts.

To get there, though, you have to train yourself to see your world photographically, assessing a scene and breaking it down into its components. Once they're isolated, even if only mentally, you can then manipulate them with whatever tools your camera puts at your disposal.

Composition. This refers to the way the physical elements in a photo are framed and how they relate to one another . . . the lines, the shapes, the proportions. It often makes for a more interesting photo to frame your subject with secondary elements in the environment, such as windows and branches. As well, even as far back as the ancient Greeks, artists and architects were keenly aware that utilizing certain ratios in their work produced aesthetic and spatial harmony.

In this mysterious shot, the Rule Of Thirds brings together a triptych of light, shadow, and texture so distinct that it almost looks like a composite.

A simple but effective principle to start with is the Rule Of Thirds. While looking through your camera's viewfinder, mentally overlay a tic-tac-toe grid across the scene. Now forget about planting your subject smack in the center. Instead, by orienting your subject and other elements along the lines marking the 1/3 and 2/3 ratios, either vertical or horizontal, the offset can produce an image that's more complex and artistic.

Rules are made to be broken, but it doesn't hurt to be grounded in them before you experiment. Also, although editing software makes it easy to crop your image into creative submission, you'll be ahead of the game if you begin applying such principles to how you observe the scene from the outset.

Depth of field. Whenever you look at anything in our 3D world, it sits along a continuum of objects and regions both in front of and behind it. Because our eyes (and camera lenses) generally don't perceive everything with equal clarity, part of this continuum will be in focus and the remainder out of focus. A photo's depth of field, then, is the portion of the continuum that's actually in focus. The greater the depth of field, the more extensive the focused area will be.

Your camera's aperture is key here. Low settings (f2, f4, etc.) open the aperture wide and impose a short depth of field. This is useful for blurring background clutter so your subject remains the clear focal point. High settings (f16, f22) constrict the aperture but extend depth of field, letting you bring more of your environment into focus along with your main subject.

There is also a linked relationship, called reciprocity, between the aperture setting and shutter speed. Because each f-stop position doubles (or halves) the amount of light allowed through the aperture, a corresponding increase (or slowing) of the shutter speed is required to maintain an optimal exposure. So if you're able to use your aperture to manipulate depth of field, be aware that this will also mean paying attention to your shutter speed.

Movement. If your subject's in motion, the image may blur, but sometimes this is what you want. If done well, it can give your photo a kinetic excitement. If done poorly, it may end up with an ugly smudge. We'll discuss this momentarily.

Lighting. It is impossible to overstate the importance of light to a photo. Its strength, quality, and direction dramatically affect the way a shot turns out. Too little light obscures detail; similarly, backlighting something tends to silhouette it. Too much light washes away detail in a white flood, particularly if the light's coming full-on from the front. Light from above or below a subject throws long shadows that distort its appearance, especially facial features, while side lighting is the most flattering, causing subtler shadows that gently bring out shapes and contours.

Direct lighting hits the subject unobstructed from the source, causing starker contrast between lit and shadowed areas. Diffuse lighting reflects onto the subject from several directions at once, pleasantly revealing more surface area.

Portraits & Candids

Landscape specialists may disagree, but we believe lighting is probably most crucial when you're taking pictures of people. Whether you're snapping folks on the fly or conducting formal sit-downs, the principles are the same; you'll just have more time to set the scene in the latter.

Outside. When possible, use natural lighting, ideally early or late in the day when the sun's oblique angle promotes side lighting; position your subject so you're taking maximum advantage of this and not keeping the sun squarely at his back or in her face. If the sun is overhead, causing harsh shadows, move to a shady spot where the light is more diffuse. Of course, on cloudy days, you will have nothing but diffuse light to exploit. Don't overlook your EV controls. If you're shooting in the glaring sun, underexposing can help you smooth out the more unforgiving effects.

The world isn't always made of squares. This photo, composed of intersecting and overlapping triangles, directs the eye toward a distant walking figure set just off-center.

Depth of field can run to extremes, as long as your camera allows it. At left, a very short depth means that objects separated by as little as a foot or two are in noticeably different fields of focus. At right, using a maximum wide angle retains landscape detail even though the foreground and background are miles apart.

Inside. Indoors, you can use natural lighting by shooting near windows, glass doors, and skylights. Don't shoot directly toward a window, or you'll end up with backlit silhouettes, but you can compensate with a higher EV setting.

Use your flash. Sometimes you have little choice but to bring in your flash. However, in the tighter confines of interiors, its effect can be amplified, blasting faces with so much light it washes out skin tone and detail. Try taming its excesses by filtering the burst through tissue paper or diffusing it by scattering reflective surfaces out of the frame, such as rumpled aluminum foil.

General tips. For close-up portraits, zoom in with your telephoto for a more flattering perspective; wide-angle shots can cause undue emphasis on such features as ears and noses. Also, if you're photographing children, hunker down into their world to enhance the viewer's relationship to them.

Up Close & Far Away

Many budget-level digital cameras come with some optical features that, for the standard 35mm model, would require an investment in one or more additional lenses. (Some high-end digitals let you swap one lens for another.) Try using your camera's built-in zoom to radically shift perspectives on your subject—probably at the touch of a button.

Lighting tells a Tale Of Two Sisters: At left, taking the picture in the shade lets the diffuse light reveal all of Ananda's face. At right, the direct sunlight plunges half of Zoe's features into shadow.

All zooms are not equal, though. They come in both optical and digital forms. Some cameras employ one or the other; others offer you a choice. If you have a choice, go for the optical. An optical zoom is the genuine article, accomplished by physical movement of the lens. This means you'll be capturing an image in greater detail. In contrast, a digital zoom involves some internal fakery. Rather than capturing more detail, it merely magnifies what it sees from the same distance. All this increases is your chance of jagged edges and blockiness in small details.

You can use your zoom for three types of pictures:

Telephoto shots. When it isn't feasible to walk right up to your subject, let your telephoto do the legwork by zooming in as close as it permits. This tends to shorten depth of field, which can help reduce background clutter and keep your subject the center of attention. On the other hand, employing your telephoto in landscapes or other shots involving wide spaces can create an illusion, reducing the apparent distance between objects. For example, if you shot a barn in a clearing set against a backdrop of distant woodlands, the forest and the barn may appear to be much closer.

Wide-angle shots. By zooming out rather than in, you determine how much of the surrounding area will be admitted into your shot. Going wide-angle is optimal for landscapes, buildings, and other shots in which you desire a broad, sprawling perspective. It will also lengthen your depth of field, letting you capture a richly detailed panorama.

Macro shots. Strictly defined, macrophotography refers to recording an image between life-size and as much as 10 times life-size, but the term is often used more loosely. By engaging your camera's macro setting, you can get up close to an object, shooting from just a few inches away, which is perfect if you want an extreme close-up of flowers or insects, for example, or something like tree bark for use as a textural layer in a composite. Depth of field becomes especially vital in a macro shot, with incremental advances toward your subject bringing about a corresponding reduction in depth of field. Also, take care that you don't exceed your lens's capabilities, moving in so close you end up distorting the object's proportions.

Action Shots

When photographing sports and other events involving speed and motion, you'll want to accentuate the kinetic nature of the activity. Compared to taking portraits and still-life photos, there's a higher premium on being quick on the draw. In contrast to film cameras, some digital models exhibit a second or so of delay between the instant you press the shutter and when the picture is taken. If your camera is one of them, get familiar with its lag, so you can time your shots accordingly. (This is crucial in the second technique below.) If you're lucky enough to have a camera with Burst Mode, the digital equivalent of a film motor-drive, this is a perfect time to activate it, firing off a quick cluster of shots at once.

Frozen motion. When shooting a moving target, you can catch the action in two distinct ways, depending on your shutter speed. Using a slower speed (1/30) will permit some blurring of the figure, emphasizing its sense of motion. With a fast shutter speed (1/500), you can stop time, capturing a basketball player hanging weightless in midslam dunk, or, in an extreme example, a hummingbird's wings in perfect clarity.

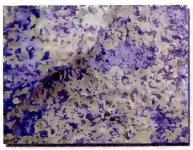
Panned action. In this case, not only is your subject in motion . . . so are you. Rather than shoot while holding yourself as still as possible, you'll shoot while pivoting at the waist, deliberately panning parallel with your subject to keep it centered in your viewfinder. By matching your own speed relative to that of your subject, you can capture a crisp shot of the subject set against a background that's streaked and blurred. Again, use a slower shutter speed, and if you and your subject are within a few yards of each other, try using your flash to further pick them out against the background.

Look, Ma, No Film!

When doing creative work, your mindset can be as important as your technique. We've heard more than one veteran photographer state that if you get a single great shot out of an entire roll, you're doing well. Unfortunately, that means lots of wasted film and paper, plus the hours lost to darkroom work: developing negatives, making test strips, squinting at them through a magnifier, and then laboring to create perfect prints.

Without a doubt, then, going digital liberates you from many of film photography's more prohibitive aspects. You can really get on a creative roll when you're not hearing a cash register ring every time you click the shutter. And with high-capacity storage media able to hold several dozen or even hundreds of shots, you may not have to stop for a long time.

However, we've also heard many photographers, from novice to veteran, talk of being so overwhelmed by how many shots they've accumulated during a prolific day that they lose perspective on what's worth working on and what isn't.



Your camera's macro setting can bring you nose-to-nose with the natural world. Notice the extremely shallow depth of field, with blurring in the upper left.

This is one area in which digital cameras have a tremendous advantage over their analog predecessors. Because digitals usually feature a small LCD (liquid-crystal display), you can see what you've done moments after your finger has pressed the shutter button.

To prevent getting swamped by a tidal wave of shots, let the LCD be your first line of defense. If a picture falls short of what you're after, keep trying until you get it right, then use the camera's storage management menu to delete the losers on the spot. In the short run, this will free up smaller-capacity media for more winning shots. Also, when you later load the photos into your PC, you can work with greater focus rather than waste time transferring unwanted images that you'll have to sift through and discard.

A word of caution, though: When making judgments based solely on what you see in the LCD, don't be so eager to jettison your rejects that you trash shots you've only been fooled into thinking are worthless. The LCD is great for informing you when a searing flash reflection has ruined a shot or whether it's been framed well. If an elbow jostle at a holiday dinner causes you to cut off the heads of your family, you'll know right away the photo isn't a keeper. But what appear to be smaller flaws may instead be a by-product of the LCD itself and its limited resolution. We've seen snaggle teeth and lopsided eyes straighten right out as soon as the image was transferred into the superior viewing environment of the computer. So when in doubt, wait until you see it on your PC to decide.

At left, shooting from a stable position with a slow shutter speed blurs the running figure; her arm appears partially translucent. At right, panning with the sprinter keeps him in focus while the background trees blur and streak.

Smile

With a digital camera, you can record moments for posterity and enjoy them before the moment is even done. If you're the artistic type, you can easily collect raw imagery that, with the proper software, you can then manipulate and warp beyond recognition.

Digital's convenience doesn't mean that expertise comes overnight, though. You're still in for a lot of trial and error. Not only does practice make perfect, but it can also be a lot of fun along the way. ■

BY BRIAN HODGE

On The Move

Putting Your Pictures In Place

WE'RE A CLICK-HAPPY COUNTRY. Most of use have a digital or film camera that's either an SLR (single-lens reflex) or a more affordable point-and-shoot. Film cameras are fading out of the picture, so to speak, as digital cameras become more affordable. Many point-and-shoot digital cameras cost about the same as comparable film cameras. And the storage medium used in digital cameras is reusable. Why buy a 24-exposure roll of film for $7 when you can buy a reusable 32MB flash card that can hold dozens and dozens of photos for $25?

Once you take those dozens of pictures, you have to park them in your PC. A digital camera lets you move photos from your camera to your system in a couple of ways. Not all cameras use the same options, however. Most cameras have a USB (Universal Serial Bus) connection and an on-camera storage option that you can use to move pictures to your PC. Some use memory cards, others use microdrives, while still others use miniCD-Rs (miniCD-recordables) or even floppy diskettes. We'll examine the different ways you can transfer photos from a digital camera to a PC and tell you which method we think is the best. We'll also take a look at the many storage options that digital cameras use and describe their strengths and weaknesses. Let's begin with an overview of the most basic (and most universal) way to move pictures to your PC: the USB connection.

From Here To There

The majority of digital cameras have both a USB 1.1 connection and a memory card that you can use to transfer photos from your digital camera to your PC. There are other options, as we'll see, but these two methods are by far the most popular, and USB is the most popular method of all. Practically every digital camera has a USB port.

USB. The USB connection is certainly easy to use. All you have to do is connect one end of a USB cable (which more than likely came with your camera) to your computer's USB port and plug the other end into the camera. The PC will detect the camera through the USB connection, after which you can download the photos to your PC. USB's greatest advantage is that it's easy to use. It's no more difficult than plugging in a lamp or a toaster. However, there's one drawback to moving pictures to your PC via a USB cable: It drains battery power from the digital camera because you have to leave the camera on when transferring pictures.

Memory cards. Memory cards are the most popular type of storage medium for digital cameras. The majority of digital cameras use a removable memory card of some sort, although there are many different kinds. The most popular memory card format for digital cameras is CompactFlash. All you have to do is stick a CompactFlash card in a slot in the camera, and the camera will store pictures on it. Other examples of memory cards you will likely see are SmartMedia, Secure Digital, Sony's Memory Stick, and the XD-Memory format from Fujifilm.

You can leave the card in the camera and transfer images you've stored on the card to the PC through the camera, but you can also buy a separate memory card reader that you can attach to your PC. The memory card reader will connect to your PC via a USB cable. Simply pop the card out of the camera and stick it in the memory card reader. It's similar to popping a floppy into a floppy drive. Once the flash card is in the reader, you can transfer images from the card to your PC and then delete the images

from the card and use it again. It's like buying one roll of film that you can use practically forever. Of course, you can buy and use several memory cards of various sizes. Memory card sizes range from 16MB to 512MB, and they'll continue to get larger.

It's nice to have a few extra memory cards with you when shooting pictures because you can shoot larger, higher quality images without having to worry about running out of storage room. When one card is full, just pop in another one. If you have several cards full of pictures, it's a little more convenient to use a memory card reader to transfer the photos rather than pop cards in and out of your camera.

Memory cards, such as CompactFlash and Secure Digital, require a compatible reader, so be sure to buy one that works with the storage media your camera uses. Some readers have more than one slot and can read more than one format. Most memory card readers only cost about $50, which isn't terribly expensive as far as PC peripherals go. There are a few adapters for various types of media also. For notebook users, there are PC Card adapters for CompactFlash cards.

IBM's Microdrive is similar to a memory card in function, but its design is quite different. A microdrive is a tiny hard drive (about an inch wide) that stores several hundred megabytes, or even a full gigabyte, of data. This is a huge amount of storage for such a small package. And microdrives are compatible with CompactFlash Type II cameras and memory card readers. Unfortunately, most of the affordable point-and-shoot digital cameras use CompactFlash Type I memory cards, not Type II. Many midrange and high-end digital cameras do use the Type II memory cards, so you can use a microdrive with these cameras.

On The Other Hand

We think that memory cards in general are preferable to other types of storage and transfer options, but there

Memory card readers are inexpensive and quickly transfer your pictures from the card to your PC.

are certainly plenty of alternatives. The following options are not quite as popular as using a camera's USB connection or a memory card reader, but they're still worth noting.

Docking station. The USB and memory card readers are by far the most popular ways to transfer images from your digital camera to your PC, but they're not the only ways. A few companies, such as Kodak and Hewlett-Packard, make docking stations for their cameras that you can use to transfer images. A docking station connects to your PC via a USB connection. Attach the camera to the docking station and you can transfer photos to your PC through it.

The nice thing about this option is that your camera's batteries won't run down while you're transferring pictures. In fact, the docking station will recharge the camera's batteries while you're transferring images. The drawback is that docking stations are not universal. You have to buy a camera from a company that uses a docking station, and you have to buy a docking station that's compatible with your camera. Even if you buy the same brand of camera and docking station, you may have to get an adapter for your camera to use the docking station.

MiniCD-R/RW. You won't find many cameras with an internal CD-R/RW (CD-recordable/rewriteable) recorder, but there are a couple of digital cameras that save pictures to CD-R and CD-RW media—not the full-sized media, though. That would make for too large of a camera. Rather, digital cameras use 8cm (or miniCD) CD-R or CD-RW media. These miniCDs store about 185MB of data, which is a pretty large amount of storage for a digital camera. Nearly every optical drive can read 8cm CD-Rs and CD-RWs. Just pop the disc out of the camera and into your computer's optical drive and save the files to a folder on your PC's hard drive. No need to mess with cables, no need to mess with the camera, no need to buy an external reader or docking station. You can also simply pass the disc to someone else if you want to share your pictures.

Even though the miniCDs are a lot smaller than regular CD media, they're not exactly tiny. The size of miniCDs still makes for a somewhat awkward camera design, with one side of the camera typically having a large round edge. You won't find a slim point-and-shoot camera that uses miniCDs. Those pocket-sized cameras almost always use the memory cards we discussed above. Also, the discs need to spin up to record the data, just as a normal CD-RW drive does when it records data, which means that you may have to wait a moment before you can take your next shot. Furthermore, although the 185MB of storage is pretty good, we already have microdrives and memory cards that can store far more data than that, and the form factor of a memory card is more compact.

FireWire. As we mentioned earlier, nearly every digital camera has a USB port that you can use to transfer images from your camera to the PC. Digital *camcorders* use FireWire to transfer video to the PC. FireWire is much faster than USB 1.1, but you typically don't see digital cameras that use FireWire connections, at least not at this time. We did find one digital

camera, the Canon EOS-1Ds, that has a FireWire connection; however, this is a professional (and very expensive) digital SLR camera, and we'd expect it to have all of the high-end bells and whistles, such as FireWire.

Some digital cameras can use a docking station to transfer photos to your PC and recharge your camera's batteries at the same time.

Most digital cameras really don't need a FireWire connection because they don't store that much data. You can transfer 16MB or 32MB of data through a USB connection fairly quickly. But if you fill up a 1GB microdrive, it'd be nice to have a digital camera with a FireWire connection.

Floppy diskette. Just when you thought this ancient storage medium was finally going away, a digital camera maker tries to bring it back. There are one or two digital cameras, such as the Sony Mavica MVC-FD200 that use the old-school 1.44MB floppy as a storage medium. The advantage to using floppies is that nearly every computer still has a floppy drive, so you can share the images stored on the floppy with just about anyone very easily (just as you can with an 8cm CD-R). Floppies are also fairly cheap.

There are two drawbacks to using floppies in digital cameras. First, 1.44MB of storage is tiny. You can store only a few low- to medium-quality images on a floppy, whereas you can store hundreds of images on a large memory card or microdrive, both of which are much more compact than a floppy. And, as with the 8cm CD-R cameras, the storage medium makes for an awkward camera design. No tiny point-and-shoot compact cameras here; the floppies are simply too big.

Our Favorite Method

We like using memory cards to move pictures from digital cameras to PCs, and of the many formats available, CompactFlash Type I cards are our favorite. CompactFlash Type I cards are relatively inexpensive and available in various sizes; a number of digital cameras, not to mention other electronic devices, use them. You can also use CompactFlash Type I cards in devices that have a CompactFlash Type II slot. It's a versatile medium, and the price of the cards is hard to beat.

Having said that, we don't recommend that you restrict your digital camera buying decision to cameras that use CompactFlash Type I media. There's certainly nothing wrong with digital cameras that use Smart Media or XD-memory cards. If you find a digital camera you really like that uses a different kind of storage media, you should buy it. ■

BY MICHAEL SWEET

Move It On Over

If you'd like a little help transferring photos from your digital camera or memory card reader to your PC, you should use Windows XP's Microsoft Scanner And Camera Wizard. The wizard will find the photos stored on your camera or memory card and help you put them in their proper place. Connect the camera or memory card reader to your PC using the camera's USB cable. Your computer should detect the new device and install drivers for it automatically. In some cases, you may have to install the software that came with the digital camera because some cameras use their own software or wizards for transferring photos to your PC.

If you are using WinXP, a dialog box should appear after you connect the camera or place a memory card in the memory card reader, asking what you would like Windows to do. The dialog box will list several options, such as copy pictures to a folder, print pictures, or view a slideshow. Select the first option (copy pictures to a folder) to use the Microsoft Scanner And Camera Wizard.

The Scanner And Camera Wizard walks you through the process of transferring pictures to your PC. Click the Next button after the wizard starts. The wizard will display the images stored in your camera. There is a checkbox in the upper-right corner of each picture. Click the checkbox to select or deselect each image. The wizard will transfer only the images that you have selected. Click Next once you've made your selections.

At the next stage of the wizard, you can type a name for the group of pictures in the text field, and you can also choose which folder to save the pictures in. If you wish to delete the pictures stored in your camera (after you transfer them, of course), click the Delete checkbox. Click the Next button again. The wizard will scan the pictures and save them in the directory you selected. Click Next one last time and then click the Finish button.

You don't have to use the Scanner And Camera Wizard. Your OS (operating system) should recognize your camera or memory card reader as a separate drive, usually labeled Removeable Disk. It may appear as Compact Flash Drive or Memory Stick Drive and so on, depending upon the type of media you're using. You can drag and drop photos from the camera or reader to another folder on your PC using Windows Explorer, just as you would transfer data from a floppy or CD-ROM. Right-click the drive in My Computer and click Explore to open Windows Explorer. Click through the folders along the left of the window to find the folder containing your images, which will appear on the right side of the window. Click an image on the right side of the window and drag it to a folder on the left side of the window to copy it to a new location. ■

Photo-Editing Tips

Tricks That'll Enhance Your Image

THE PROLIFERATION OF DIGITAL CAMERAS and powerful yet inexpensive scanners is giving computer-savvy users much more control over their pictures than they had in the past. The days of filling up a roll of film and impatiently waiting to see how your pictures turned out are quickly fading. Now, it's possible to preview shots directly on the camera, get rid of the ones you don't want on the fly to free up space, and immediately import all your images into your computer for printing.

The problem is that all this new technology hasn't necessarily made people better photographers. Shots still come out fuzzy, colors often don't look quite right, images get overexposed or underexposed, and digital data introduces anomalies that we never had to deal with in the past. Fortunately, inexpensive image editors let you correct and enhance images using the same tools professionals have relied on for years. You can read our comparative review, "Recipes For A Perfect Picture," in this issue to find an editor that's right for you; most of the tools and tips in this article apply to any of the popular image editors available today.

When you capture images with a scanner or digital camera, the picture is stored as a series of **pixels** (picture elements). Pixels are individual dots that contain unique color information; the number of pixels in an image defines its resolution. For example, an image with a resolution of 800 x 600 has 800 columns of vertical pixels and 600 rows of horizontal pixels, for a total of 480,000 pixels.

The higher the resolution, the more detail an image can have. Think of graph paper: If you draw a large circle on a sheet of graph paper with 100 x 100 squares, it looks coarse with curves that resemble stair steps. Now, draw a same-sized circle on a sheet of graph paper that's the same size, but this sheet has 1,000 x 1,000 squares. Up close, you can still see the stair-step effect, but from a normal distance, your image looks like a circle because there's more detail available to create the curves.

Image editors are designed to manipulate pixels and address them individually or in groups. Each pixel contains details about its color, and image editors can modify that color data directly or use mathematical algorithms to apply special effects. They can stretch or shrink a picture, make an image look like an aged photograph, or simply adjust its contrast and color to make a picture look better. The possibilities are endless, and most editors aimed at consumers have dozens of tools that automate the majority of common tasks.

The problem is that anytime you change the pixels in an image, you may create unwanted digital artifacts. These artifacts include jagged lines on the edges of objects (called aliasing), blocks of color where there were smooth gradations, and stray pixels that don't blend in with surrounding pixels. There's no way to completely eliminate these effects, but by using the proper tools, you can dramatically reduce the number of artifacts in your edited images.

Compression

Many common image formats, such as JPEG (Joint Photographic Experts Group, also called JPG), use compression to dramatically reduce

image files while reducing quality as little as possible. There are two basic types of compression, lossy and nonlossy. Lossy compression discards certain image data entirely to achieve better compression ratios and therefore degrades the overall quality of an image. JPEG is a lossy format, and when you save JPEG images, you'll usually see a slider asking how aggressively you want to compress the image. File sizes decrease and image quality degrades as compression levels go up.

Nonlossy compression uses less efficient compression algorithms that retain all of the data from the original file when you decompress it. The most popular nonlossy compressed image format is TIFF (Tagged Image File Format, also called TIF).

Decompressing an image so you can work with it never affects the quality of the image, but each time you recompress a file using lossy compression, the quality degrades. You can recompress an image as many times as you like using nonlossy compression, and it will never lose any of its original quality. Try to work with nonlossy compressed formats, or even uncompressed formats, such as BMP (bit map), as often as possible when editing; use lossy compression only when you save the final copy of the edited image.

Now that you know a little more about the technology behind digital images, we'll move on to the editing tips. Note that various controls and menu items mentioned in this article may have slightly different names depending on the image editor you use. These are the names most commonly used.

Resize Pictures

Even entry-level digital cameras usually shoot pictures at a native resolution of 1,600 x 1,200 pixels, which captures a lot of detail but is too large to fit on most computer monitors. Image editors make it easy to resize images, but there are several things to keep in mind when doing so.

Most image editors let users select from several options when resizing images. There often is a checkbox or radio button labeled Constrain Proportions or Maintain Aspect Ratio. Selecting this option maintains the proportions of the image when you resize it; if you change the vertical resolution of an 800 x 600 image to 400 pixels instead of 800 pixels, the horizontal resolution automatically resizes to 300 pixels so the image maintains its overall shape. If you don't select this option, you can manually adjust both the horizontal and vertical resolutions, but if you don't maintain the original ratio, the image becomes distorted.

Figure 1

Figure 1 is seriously faded, but adjusting the Hue/Saturation tool restored it to its former glory in seconds (bottom pix).

Resampling is another technique to consider. When you enlarge or reduce an image, the number of pixels in the image must increase or decrease. The image editor uses special algorithms to determine what pixels to cut when the image shrinks and also to determine the colors of pixels that are added to enlarge the image (a process called interpolation). Generally there are three algorithms available: bicubic, bilinear, and nearest neighbor. As a rule, use bicubic interpolation because it samples colors from eight surrounding pixels to determine the color of a pixel being added to the image. Bilinear samples only four surrounding pixels, and nearest neighbor samples one pixel and creates jagged-looking images. Occasionally, bilinear interpolation is better than bicubic because the latter can sometimes make images look too fuzzy.

You'll lose detail whether you shrink or enlarge an image. By making an image smaller, there are fewer pixels available to create the image. By making it larger, you lose detail because interpolated pixels make the image look blocky with blotches of color instead of smooth gradations.

Always make a copy of the original image before resizing, and if you ever feel a resampling method makes an image too blurry, use your image editor's Unsharp Mask (if available) to reduce the severity of the problem. Despite its name, the Unsharp Mask tool sharpens an image and enhances an object's edges, and it works much better than an editor's Sharpen or Sharpen More tools. Play around with the settings until you find one that makes the image look crisper without introducing artifacts of its own.

Let There Be Light

One of the most useful features image editors provide is the ability to adjust the color levels of an image. These tools can make a gloomy morning look like a bright afternoon or turn glowing overexposed skin into something that looks more human. Combined with the more advanced color-correction tools that we'll discuss later, you can work miracles.

Many novices rely too heavily on an image editor's brightness and contrast controls. The brightness control is usually a slider that makes pictures darker when you slide it left and lighter when you slide it right. At the extreme left, most of the pixels turn completely black. At the extreme right, most turn white. That means as you add brightness, colors become washed out, and as you reduce it, colors become murky. Use this control sparingly and always with the contrast control.

You usually adjust contrast with a slider, too, and generally it's more

useful than the brightness setting because it can bring out the colors in an image. As you reduce contrast, pixels gradually become drained of color until they turn completely gray when the contrast is at its lowest setting. Conversely, as you increase the contrast, colors become brighter. Your image will begin to lose detail, however, as you max out the contrast. Similar-colored pixels, which are distinct in the original image, will bleed into one another creating an image with large areas of few unique colors. The key when adjusting contrast is restraint. As you increase the contrast, gray begins to disappear from the image as though you were removing gauze that's been covering a print photo. Adjust it too much, however, and suddenly people begin getting big, uniform blobs of color on their foreheads where the light hits them, fabric loses all of its texture, and other details are lost. Try to strike a balance that gives the image the best possible color without sacrificing detail and keep this adjustment to a minimum.

Level The Playing Field

As useful as the brightness and contrast controls are, if you really want to salvage a faded, poorly lit, or otherwise color-challenged photograph, the image editor's Levels tool is your secret weapon. This tool lets you adjust the tonal range of an image. Most Levels tools come with an automatic setting that makes images look dramatically better, so use Auto Levels whenever possible, but occasionally you'll achieve better results adjusting the setting manually.

After opening the Levels tool, an input graph (called a histogram) shows color distribution throughout the image in terms of brightness and darkness. The far left of the graph represents true black (value 0), the far right side of the graph represents pure white (value 255); there are 254 values in between. Usually, you'll see a concentration of colors throughout the middle section of the histogram (represented by hills and peaks), with things tapering off near both ends of the graph.

The histogram may also have three triangles you can slide to different positions. The triangle on the far right controls highlights, the one on the far left controls shadows, and the one in the middle controls midtones. There are many ways to manipulate these sliders, but the easiest is to first move the triangle on the far right (Highlights) until it points to the first noticeable rise on the right end of the histogram. With that done, you can move the other triangles to fine-tune the image. In general, move triangles to the right if you want to darken the image and to the left if you want to brighten the image.

Figure 2

Figure 2 (left) had a red cast to it until we used the Color Balance tool to make the image on the right look more realistic.

Advanced Color Correction

Everyone has a pile of vacation photos sitting somewhere that have faded with age, honeymoon photos that don't quite capture how spectacular the sky looked as you lounged on the beach, or other pictures where the colors simply didn't turn out quite right. Image-editing programs separate a digital picture into red, green, and blue channels that you can then manipulate individually. Working with channels is one of the best ways to make certain colors more vibrant without significantly affecting other colors.

We have a photograph of friends standing on a grassy hill (Figure 1) that's badly faded; in it, the grass looks more yellow than green. By using the Hue/Saturation control, which divides the image into even more color groups, including yellow, cyan, and magenta, we were able to select just the yellow channel. Then, using the Hue slider, we changed all the yellow pixels in the image into green pixels, leaving the subjects of the photo untouched (because they contain no yellow pixels). By manipulating the Saturation slider, we made the grass a more vibrant shade of green. This tool allows for many special effects; we easily could turn the grass bright red, for example.

Color Balance is another powerful color correction tool that many novices overlook. This tool lets users separately skew the highlights, midtones, and shadows of a picture toward various colors. For example, you can tint the darker, shadowed parts of a picture red, and you can make highlights, such as the sky, cyan. The tool really doesn't make a lot of sense until you try it for yourself, as is the case with many image-editing tools.

In our photograph of our friend standing in a field (Figure 2), we show that it's possible to achieve dramatic results with very little work. We removed the red cast from the sky and wheat field by moving the midtones

slider toward cyan instead of red, and we augmented the blue sky by shifting the highlights toward cyan, as well.

Work With Filters

We also applied a sharpen filter to make the picture less blurry. Filters are shortcuts that automate many special effects. You can use filters for everything from blurring or sharpening an image to distorting it or applying effects that make the picture look like a painting. Today's image editors come with dozens of filters, many of which have several pre-sets; you can customize most filters using sliders and other input options.

We've already discussed the Unsharp Mask, which "hardens" edges to make them stand out more. Its counterpart is the blur filter, which makes a selection look like it is a bit out of focus but can remove jagged lines from an over-sharp picture and help blend blotchy colors.

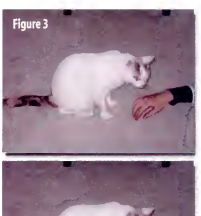
Many editors come with noise filters that are useful for removing specks of color from a digital camera image or specks of dust from a scanned image. You can use lighting filters to spotlight a certain part of an image or to make it look like a natural light is brightening a scene. There are hundreds of filters, and their effects are cumulative, so don't be afraid to experiment to achieve a unique look.

Make Selections

The preceding tips are all basic edits for an entire image, but many times, you'll want to edit a portion of a picture. Nearly everyone knows how to use the standard rectangle and oval selection tools, but there are other options, such as the Lasso and Magic Wand you may have, that work better in certain circumstances.

Use the Lasso to select freehand shapes or when you need to trace around an object. Click and hold down the left mouse button and draw the shape you want to select. The Magic Wand selects groups of pixels that have the same or similar colors. Usually you can adjust the threshold, telling the wand to select only one particular color or many shades in the same range. The magic wand is useful when you want to select a large patch of relatively uniform color, such as the sky.

Many times you'll want to add a portion of the image to the selection,



The cloning tool works best with solid backgrounds, such as carpet. It still took some massaging to break up patterns that developed when we used the tool.

deselect a single portion of the image, or create multiple selections throughout the image. You can do any of these by pressing the SHIFT or CTRL keys in conjunction with the selection tool. If you want to add to a selection without deselecting portions of the image that are already highlighted, press the SHIFT key while making the selection. To subtract from a selection that already exists, hold the CTRL key and select the portion you would like to remove.

Fix Scratches & Remove Elements

Many computer users like to store old family photos by scanning them into their computers, and aside from having to correct the inevitable color fading problems, many old photos also have scratches, flecks, or other damage that's particularly noticeable when the image is scanned. Some editors have built-in damage repair tools, but if yours doesn't, using an image editor's Cloning or Rubber Stamp tools is easiest.

A cloning tool work like a paintbrush that paints an image instead of a solid-colored line. You select a portion of the image you want to clone (generally an area adjacent to the scratch or other flaw) and then when you click the scratch, it is covered by a duplicate of the portion you selected. For example, if there is a white scratch in a blue sky, you can select a portion of the undamaged blue sky and then "paint" a copy of that sky over the scratch so it blends in with the rest of the image.

In this example (Figure 3) we've removed a hand from the scene by using the cloning tool to "paint" carpet over the appendage. It helps to clone different parts of the scene every so often so that patterns don't develop that give away the fact that you used a cloning tool, and the tool works best when there is a solid or patterned background to clone.

It Doesn't Stop There

This article barely scratches the surface of what a modern image-editing application can do, and there are hundreds of add-on products available that integrate with most editors to add even more capabilities. If you have an image editor that is compatible with Photoshop plug-ins and filters, make sure to take a look at our Web-only companion article "Focus On Filters" (http://www.smartcomputing.com/march03/addons) that reviews some of the best freeware and professional plug-ins available. With some knowledge, a lot of patience, and a little money, anything is possible. ■

BY TRACY BAKER

Print Your Photos

Are Film-Quality Prints Really Possible?

When digital cameras hit the shelves, their major draw was the ability to display decent-quality pictures on a computer screen. Everybody knew that these pictures weren't of the same quality as those a real camera took and a photo lab printed, but you didn't waste film and you didn't have to wait for the results. The only problem was that, although you could print them on your inkjet, the results were considerably short of marvelous. But we were grateful to have what we had.

Gratitude with computer technology lasts no more than six months tops, of course, and soon we wanted more. We wanted sharper, clearer pictures. We wanted richer, more realistic colors. And we wanted to be able to get good quality prints of our masterpieces without sending them off to a printing shop, which was ironic, of course, because not having to pay for prints was one of the initial charms of digital cameras. But we wanted them anyway, and the camera makers and printer makers were more than happy to oblige.

Cameras rapidly increased in resolution, rising to today's easily found devices that offer 4-megapixel image sensors and more affordable 2- and even 3-megapixel versions. Of course, megapixels don't tell the whole story. Light sensitivity, color spaces, bit depth, dark current, and other features come into play, as well, but in general, the rise in megapixels has resulted in better quality digital photos. At the same time digital cameras were making their technological leaps, inkjet printers (somewhat more quietly) were rising in capabilities, as well. More dots per inch; better color use; and increasing availability of different kinds of good photo paper made printing our photos, and giving them to people, a more realistic and pleasurable experience.

What Is Photo-Quality?

To say that a print is "film-quality" suggests an adherence to some kind of standard. But there really isn't a standard. Even in the photography business, prints are of widely varying quality (dependent on film quality, processing techniques and equipment, and so forth). Camera lenses and film typically get rated in lpmm (line pairs per millimeter), which refers to the number of black and white line pairs it can resolve per each millimeter of film frame. Most consumers buy lenses and film capable of a maximum of roughly 50 lpmm (professional cameras can reach 100 lpmm and higher); to produce a standard print size at this level of quality, you would need a digital camera capable of 8 megapixels or higher, and an inkjet printer capable of higher resolutions than we currently have.

But as with all things that use the human eye as judge, the real test lies in *perceived* quality. If we can't tell the difference, effectively there *is* no difference. This is precisely the basis on which motion pictures work (they fool the eye into perceiving motion), and it's the basis on which photography and printing work, as well. Photo-quality is relative; if the viewer thinks it's as good as a photo, it is.

But let's get more specific. The resolution of digital cameras (like that of monitors) is measured in pixels and expressed in the number of horizontal pixels by the number of vertical pixels. The resolution 800 x 600 means 800 pixels across and 600 pixels high.

Multiply these together and you get the total number of pixels for the image; in this case 480,000. This translates in digital camera terms to a bit less than half a megapixel. To get an image with the much-desired 1,600 x 1,200 resolution, you'd need a 2-megapixel camera (1,600 x 1,200 = 1,920,000 pixels).

But what about printers? As you might expect, measuring printer resolution is different. Printers are capable of a specific number of dots per inch, usually expressed as dpi. This means, quite simply, the number of dots (of any color) the printer can place on an inch of paper; a 300-dpi printer can print 300 dots across by 300 dots down in a single square inch. If there were a one-to-one correlation between the number of pixels and the number of dots, all of this would be easy to figure out, but there's not. Inkjet printers typically print several dots per pixel.

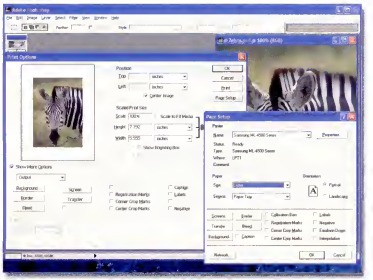
The final piece of the puzzle is image resolution, typically expressed in pixels per inch (ppi). This is the pixel resolution of the image as modified by the print size of the image. Let's take our 800 x 600 picture. Its 480,000 pixels can be printed as anything from a wallet-sized photo up to a print covering an entire wall. But the more you stretch the image, the greater the distance between the pixels and the less useful the image. The farther you stretch it, the more it becomes simply a series of dots, and once our eyes perceive the dots, they are no longer fooled into seeing a continuous, realistic image.

The correlation between your printer's resolution capabilities and the size of the prints you'll get from your digital camera is extremely interesting from a number of standpoints. The higher the print resolution (the larger number of dpi), the closer together the dots are on the page. If you print a picture at a low resolution and then print the same picture at a higher resolution, the higher-res print will be smaller because it's squeezing the same data into a smaller area. So instead of getting two identically sized prints but one with greater clarity, as most of us expect, you get the same clarity with different sizes.

Let's say you have a 2-megapixel camera that has a 1,600 x 1,200 option (1,600 pixels high by 1,200 pixels wide) for taking pictures, and you want an 8 x 10 picture, which is of course 10 inches high by 8 inches wide. Doing the calculating, 1,600 ÷ 10 = 160, and 1,200 ÷ 8 = 150, so you'll get an effective image of 160 x 150 ppi. If you shrink your picture to a 5 x 7, you'll raise the resolution to 229 x 240 ppi, and for a 4 x 6, you'd get 267 x 300 ppi.

What does all of this have to do with selecting a photo printer? Well, everything. If you want large, photo-quality pictures from your printer, you'll need both a high-quality camera and a high-quality printer. Your camera must be able to provide resolutions high enough to give you pictures of high dpi, while your printer must be capable of printing close to that level of dpi at the dimensions you want. A good rule is as follows: In order to achieve photo-quality prints with a 720-dpi printer, you'll need images of greater than 200 ppi, preferably closer to 250. If you have an even better printer, one that's capable of up to 1,440 dpi, you'll want to feed it pictures with a ppi value somewhere between 250 and 300.

None of this is to say, of course, that you can't be perfectly satisfied with 640- x 480-pixel pictures printed in 8 x 10 format. Indeed, a great many people have been more than happy printing and framing at precisely that configuration. But if you are looking for true photo-quality, these are the guidelines you will need.



The Print Options screen from Adobe Photoshop 6.0 shows the kinds of detail you need to pay attention to when preparing to print your pictures.

Achieve Large, Clear Prints

So how do you get large, clear prints? First, you need a camera capable of generating files with a large number of pixels. This will give the printer more pixels (and thus a potentially larger picture) to start with. The other way is to work extensively with photo manipulation software, taking a print and, in effect, filling in the gaps manually, giving the picture more pixels than it originally had. Today's multimegapixel cameras will provide the former, and any good photo-editing package will provide the latter. Put the two together and you have an extremely potent tool for generating large, high quality prints.

Of course, you might object, as many people do, to the whole idea of manipulating photographs. In our culture, the photograph has always been held up as a window on the truth, something that tells the real

story in ways that words cannot. But the fact is that any photograph, no matter how it's taken, is alterable, and photographers have been manipulating photographs since photography began. Two of the reasons most of us are disappointed with the quality of the pictures we take, apart from not knowing good photographic techniques, are that we don't know how to make a good print out of the raw photograph, and we don't realize that taking our film to the cheapest developing shop pretty well guarantees that the prints will be given no special attention.

Printing is an art, and like all art, the result is as at least partially dependent on the equipment and materials used, not just on the vision of the artist, or in this case, the eye of the photographer.

Inky Things

You can buy color inkjet printers in 3-ink, 4-ink, or 6-ink versions. The number refers to the number of differently colored inks the printer is capable of placing on the paper. The first three inks are cyan (C), magenta (M), and yellow (Y), which mix together to produce whatever color is required (M + Y = red, C + M = blue, etc.). When all three are mixed, they produce the fourth color, black (K). To provide a better quality of black and reduce the cost of printing regular documents (such as word processing files), 4-ink printers include black as a separate color in a separate cartridge. The final category, 6-ink printers, add light magenta and light cyan inks to the mix to help achieve lighter colors of a higher quality. These lighter colors help dispense with the use of uncolored white space and, because of that, give the appearance of greater continuity.

The 6-ink printers are somewhat more expensive than the 4-color printers. You'll get a consistently better print from the standpoint of fooling the eye into thinking it's seeing continuous color gradients and realistic color effects. Of course, you'll pay more for ink with a 6-color printer, and today's 4-color printers do a fine job nevertheless, so in the end, it's a cost balancing issue that will depend on your printing needs.

The other point to consider in choosing a photo printer is whether you can afford to have two printers, with one dedicated to photography and other color printing and the other for standard black printing for everyday documents. That's always the best choice, because it tends to keep inks and print jets working at roughly an equivalent pace, but again it depends on your needs. No matter which way you go, however, be sure to actually use your printer's color jets regularly. Letting them sit unused by printing only black for a few weeks, for instance, can cause them to dry out or clog up.

The Right Paper

Most printer owners choose standard copier paper, the kind found in most laser printers, for printing to inkjet printers, as well. For some tasks, this is perfectly fine, but if you want to use your inkjet printer to its greatest advantage, and especially for printing photographs, you should pay closer attention to the paper you choose. In particular, you should watch for the paper's absorption and brightness qualities, and, for photographs, its glossiness.

As you might expect, **absorption** refers to the paper's tendency to keep the ink from spreading into the paper. The closer the dot can remain to its appearance when initially produced, the more accurate and clear the final image. A paper's **brightness** depends on how it reflects light back to the eye; the rougher surface of a coarse paper will reflect the light off in several

Want Real Photo-Quality?

Pony Up For A Dye-Sublimation Printer

Inkjet printers aren't going to go away any time soon, but if you're looking for a reasonably inexpensive kick at true photo-lab quality, consider spending $500 to $1,000 on a dye-sublimation printer for full-sized prints or $300 to $400 for one dedicated to small prints. Also known as dye diffusion thermal transfer printers, dye-sub printers use a four-part cellophane-like film (or four separate films), each of which has a separate heat-sensitive dye embedded into it. The colors of the four dyes are cyan, magenta, yellow, and black/gray.

To make a print, the printer places the film over the paper and then passes the heated print head over the film, vaporizing the dyes and diffusing them onto the paper. The print head is capable of highly variable temperatures, allowing it to vaporize precisely the right mix of dyes onto the coated paper. The mixing of the dyes produces real colors, instead of the dithered colors produced by inkjet printers (dithering essentially fools the eye into seeing a result that isn't technically true) and a continuous tone offering a very smooth appearance. Furthermore, because the dyes permeate the surface of the paper, in effect becoming part of the paper itself, the prints are much less likely to fade over time. Dye-subs are also faster than inkjets, taking from one to two minutes to print a full-color image.

So why not run out and buy one for everyday use? Well, they're one-trick ponies; they print full-color images extremely well. But they're not as efficient at simple text printing, nor do they let you print on materials other than their required specially coated paper. But if you want stunning prints of your digital photos, they'll do it every time. ❚

directions, while a smoother paper will provide a more concentrated reflection. The smoother the paper, the brighter the image.

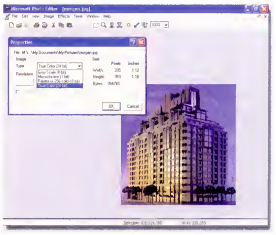
As for glossiness, well, if you want high gloss, you have to pay for it. High-gloss, heavy photo paper is the most expensive of the lot, but also the best for your buck. Not only does it help with absorption issues, it also produces the highest brightness levels. Mind you, it's also the paper that beams the most light back at you, so for easier viewing, a good quality semigloss (satin) finish will do the trick, albeit with a loss in color richness. Still lower-gloss papers are also available, and these "matte" finishes provide a less expensive alternative that provides decent color and excellent black and white prints. If you want to print postcards, you'll have to go to an even heavier stock (60-pound cover stock or higher), but be careful to check that your printer will in fact work with paper this heavy.

In addition, although it sounds a bit fishy, you should always consider buying photo paper from the same manufacturer as the printer itself. This isn't always necessary, but in practice, you're likely to discover that, especially with the most expensive papers, the manufacturers closely match the paper to the printer. Because at this price level you're out to get the best photograph possible, rather than the most economical picture, why take a chance? If you have an Epson printer, buy Epson paper. At the very least, if something goes wrong with your prints and you have to call technical support, the conversation won't degenerate into an endless loop of the printer manufacturer blaming the paper manufacturer and vice versa.

Finally, be sure to allow your print enough time to dry. It's ink, after all. While there are no hard and fast rules about this, try to allow 24 hours for drying if you plan to put the print in an envelope or a scrapbook. That way, the ink will stay on the paper it was intended for.

Tell Your Equipment What's Right

Okay, you're ready to go. You have your expensive 3-megapixel digital camera with all the trimmings. You have your brand new, full-featured color inkjet printer with its fresh ink cartridges and with dpi resolution to spare. You have high-gloss, heavy paper ready to place in the tray.



The Properties dialog in Microsoft Photo Editor, included with Office, clearly shows the size of the file to be printed, but gives you few other details.

If you haven't taken the photo yet, be sure to tell the camera what quality you'd like it to produce. Go into your camera's configuration and, if you want the best quality print, choose the highest quality setting for your pictures. Depending on the camera, this setting could be called resolution, size, or quality. If you have a choice among file types to which to save the picture, choose one with higher resolution capabilities, such as TIFF (Tagged Image File Format), over a lower-res file type, such as JPEG (Joint Photographic Experts Group). Of course, given that most digital cameras come with inexplicably small memory cards, this will mean that you can store fewer pictures at a time, but keep in mind that this time you're gunning for quality, not quantity.

Next up, your PC. By default, your printing software won't likely be set to make use of your printer's highest resolution or highest quality paper. Go into your application's Print menu and from there into the configuration menu for your printer. Tell your printer *precisely* how you want it to behave. Select the paper you wish to use and the resolution at which you want it to print. Remember, the higher the resolution, the more ink you use and the longer the printing will take, but the result will be that much better.

On more thing: Be absolutely certain that your paper has the necessary room to enter and exit the printer smoothly without touching anything. Many print jobs have been ruined because a hand-fed sheet of glossy paper goes in crookedly or touches the desk or even a pencil cup on the way out. To get a high-quality print, the paper must be allowed a smooth, unrestricted passage through the printer.

If you use advanced photo manipulation software, such as Adobe Photoshop, be careful to check that the settings you use for the software work in conjunction with your printer's settings. This shouldn't be a problem, but it's worth checking anyway. You don't want to set a resolution or print size in the software and have your printer do something else.

Above all else, test before printing. Using your printer's lowest resolution and some regular copier paper, make sure everything's ready to go. Photo-quality prints cost too much (in ink, paper, and time) to find you have to throw them away. And if you're working with specially sized paper, make sure you know how to put it through your printer properly; the easiest way to do this is to cut some regular paper to size and print a low-res picture of that exact size first. ■

BY NEIL RANDALL

Glossary Of Terms

aperture—In reference to cameras, the aperture is an opening at the front of the camera that determines the amount of light that will pass through the lens to fall on the image sensor, which is used to record an image. The aperture is measured with a term known as the f-stop. The higher the f-stop setting, the more light that passes through the lens.

CCD (charge-coupled device)—An instrument with semiconductors arranged so the output (electrical charge) from one semiconductor is the input of the next semiconductor. This type of array is used as the light-detecting component in many digital cameras, video cameras, and optical scanners.

compression—A method of condensing information so it can be stored in less space or transmitted in less time. Many large graphics and sound files are compressed so you can download them faster or store them in less space. Although data compression can be done in many ways, a compression program generally looks for redundancies in a file, then compresses the identical pieces of data into one representative token. There are two types of compression: lossy and nonlossy. Lossy compression discards certain image data entirely to achieve better compression ratios and therefore degrades the overall quality of an image. JPEG (Joint Photographic Experts Group) is a lossy format, and when saving JPEG images, users are presented with a slider asking how aggressively they want to compress the image. File sizes decrease and image quality degrades as compression levels go up. Nonlossy compression uses less efficient compression algorithms that retain all of the data from the original file when they are uncompressed. The most popular nonlossy compressed image format is TIFF (Tagged Image File Format).

digital camera—A camera that can record still or moving images as bits in a computer file. You can load digital images directly into computer programs and reproduce the images an infinite number of times without losing image quality.

dpi (dots per inch)—Dots per inch is a measurement of resolution used when describing the quality of output from a printer, scanner, or monitor. Depending on the context, dpi is the number of dots that are printed, scanned, or displayed per each linear inch. Quality increases with more dpi. Although the variable is linear, it's used horizontally and vertically, so when applied it determines the number of dots within a square inch. For example, a printer set at 300dpi prints 90,000 dots per square inch. Doubling the dpi to 600 means the dots quadruple to 360,000 dots per square inch. More dots translate to more information. And more information means the device needs more memory to process all the data.

f-stop—Like film cameras, digital cameras use f-stops to measure the size of the aperture being used to shoot an image. The aperture is the opening in the lens that determines how much light will be allowed to pass through the lens. An aperture with a smaller f-stop, such as f2, lets more light through the lens, while a larger f-stop, such as f11, lets less light through the lens. A smaller f-stop would be used to shoot images where light is limited.

image editor—A graphics program used to edit or manipulate an image, either by adding a user's special touches to a computerized drawing or using computer-generated manipulations such as morphing. Image editors are different from drawing packages because they are specifically for changing existing images, not for generating them from scratch.

ISO (International Organization for Standardization)—The Geneva, Switzerland-based body of standards organizations that establishes an international standard for data communications. The ISO, which was founded in 1947, comprises national organizations from approximately 90 countries. The U.S. representative to ISO is the ANSI (American National Standards Institute). One of the ISO's standards is the ISO film speed code. In photography, higher ISO numbers indicate film that is more sensitive to light. Some digital cameras have ISO settings that let you choose an ISO film speed, which the camera's internal software will emulate by amplifying the signals on its sensor.

megapixel—One megapixel is composed of 1,048,576 pixels. The speed with which a 3D graphics card can transfer data to a display device is usually measured in megapixels. Higher megapixel ratings usually equal higher maximum device performance.

resolution—The amount of definition and clarity in an image on a monitor, printer, or digital camera. In monitors, resolution is measured by the number of pixels the device can display. In printers, resolution is measured in dpi (dots per inch) that can be printed on paper. A digital camera's resolution is measured by the number of pixels that make up an image, such as 640 x 480 pixels.

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PC Project:

A Better BIOS

Upgrade Your BIOS For Better PC Performance

Upgrading your BIOS (Basic Input/Output System) sounds a little daunting, doesn't it? I'm here to tell you it isn't; it's actually a very simple process that can bring an older PC back to life. By upgrading, or flashing, your BIOS, you can add new features, correct existing problems, and gain support for newer technologies.

Before I explain how I upgraded my BIOS, let's talk about what a BIOS is and why you might want to upgrade yours.

For example, the original BIOS in the Dell Dimension series didn't let the system be set to boot from a CD-ROM. However, many applications and OSes (operating systems) require this, or at the least, they install more easily. To solve the problem, Dell introduced a BIOS upgrade.

Also, BIOSes released prior to Windows XP couldn't support WinXP ACPI (Advanced Configuration And Power Interface), which is responsible for letting you put your PC to sleep. In response to this problem, BIOS upgrades including support for WinXP ACPI were released.

Now, I'm not recommending that everyone go out there and start flashing because not every BIOS needs to be flashed, but if there's an upgrade available, it may do your system some good. Before I explain how I upgraded my BIOS, let's talk about what a BIOS is and why you might want to upgrade yours.

BIOS Basics

BIOS stands for Basic Input/Output System, and its job is to get all of your hardware and software to talk to each other when you boot up your computer. In other words, the BIOS is responsible for your computer's initial startup routine; without it, your computer wouldn't know how to do things, such as control basic hardware operations or communicate with the system clock.

The BIOS is a routine that's stored in your computer's memory, either in ROM or flash memory. When stored in ROM, the BIOS is more difficult to upgrade. Because you can't erase, modify, or write to ROM, you have to replace a chip in order to upgrade the BIOS. When your BIOS is stored in flash memory, you can upgrade it electronically because you can modify flash memory. For the purposes of this article, I will use the terms "upgrade" and "flash" synonymously.

What's your version? You'll need to determine your BIOS version, and one way to do this is to watch the screens as your computer boots up. The first screen should list the BIOS manufacturer, as well as the BIOS string, version, and date. Watching for information on a screen that quickly flashes by can be nearly impossible, however, so here's another way to check for your BIOS version.

In Windows 98, go to Start and select Programs, Accessories, System Tools, and System Information. In the System Information window, select Windows Report Tool from the Tools menu. In the Windows Report Tool window, select Collected Information from the Options menu. In the Collected Information window, scroll down to the BIOS= line under the

System Settings To Copy section and note the information there.

In Windows Me/XP, go to Start and select Programs (All Programs in WinXP), Accessories, System Tools, and System Information. In the System Information window, under the System Summary section, locate the BIOS Version line in the Item column and note the BIOS information in the Value column. With BIOS version info in hand, check the manufacturer's Web site for a section called Downloads or something similar to see if there's an upgrade available for your BIOS.

A BIOS upgrade is actually a program you'll run on your system to make the changes. If you find an upgrade, installing it can be as simple as downloading the program to your desktop and saving it to diskette. Or, if the file is compressed, you may have to decompress the program and then save it to diskette.

Once you have the upgrade on floppy diskette, you'll have to insert it into your PC's floppy drive and reboot your computer. When your PC restarts, it boots from the diskette, and you'll see a DOS prompt. From there, locate your upgrade program and follow the instructions (obtained at the BIOS upgrade maker's site) for installing the upgrade. After the upgrade is installed, remove the floppy and reboot your machine.

Dude, I'm using a Dell. For this project, I used an older Dell Dimension 4100 with a 700MHz Pentium III processor, a 60GB hard drive, and 256MB of RAM, running WinXP Pro. I checked the Dell Support site (http://www.support.dell.com) to see if an upgrade was available.

After signing into Dell's support, I clicked the Download tab, which includes downloads for drivers, patches, and other software updates. To narrow my search, I completed the following steps: Select Your OS (Microsoft Windows XP), Select The OS Language (English), and Select A Download Category (Flash-BIOS Updates).

On the next page, under the Select A Device section, I clicked the Dell Dimension System BIOS link. Next, under the Select A Download Type, I clicked the Dimension 4100 A11 FlashBIOS link. I scrolled down the page and noted that the change from A10 to A11 involved a fix to solve the Creative Labs Audigy sound card "high pitched squealing/lockup" problem. I then selected a download format: 4100_A11.exe, which downloads the flash to a DOS-bootable diskette, or B4100_11.exe, which downloads a compressed set of files to your hard drive where you then have to unzip the files and create diskettes. I selected the 4100_A11.exe option.

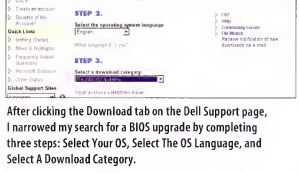
On the Downloads page, under Download & Install, I clicked the Download Instructions link and printed the instructions. I clicked Download Now and saved the upgrade to the Desktop. Once saved, I pressed Windows-M to minimize all open windows. I inserted my formatted floppy into the floppy drive, right-clicked the 4100_A11 icon on the Desktop, and selected Send To, 3 1/2 Floppy (A:).

With the upgrade on the diskette, I restarted my PC and the computer booted from the floppy drive. After the reboot, I had a DOS screen with an A: prompt. To get to the BIOS program, I typed **DIR** and pressed ENTER. I scrolled through the diskette's directory and located the flash program: 4100_A11. I then typed **4100_A11** and pressed ENTER to start the program.

The Verifying System Configuration screen appeared with the message, Press Any Key To Continue. I pressed ENTER and the message, Press *Y* To Replace "A10" BIOS With "A11" BIOS appeared. I pressed *Y* and the BIOS upgrade started.

After about three minutes, I saw the message: Flash Program Successful. Press Any Key To Reboot. Before pressing a key, I removed the diskette from the floppy drive and pressed ENTER. When the system restarted, I revisited System Information to make sure the upgrade was successful. I located the BIOS Version/Date line and noted the value had changed from Intel Corp. A10, 10/2/2001 to Intel Corp. A11, 6/11/2002, which indicated a successful upgrade.

After clicking the Download tab on the Dell Support page, I narrowed my search for a BIOS upgrade by completing three steps: Select Your OS, Select The OS Language, and Select A Download Category.



To verify that the BIOS had been upgraded, I checked the BIOS Version line in System Information by going to Start, All Programs, Accessories, System Tools, and System Information. When I saw Intel Corp. A11, 6/11/2002 in the BIOS Version line, I knew the upgrade had been successful.

Undaunted

As I said, the thought of upgrading your BIOS sounds scary, but it's actually easy. The whole process of finding the flash, downloading it, and upgrading the BIOS took approximately 40 minutes. That's not that much time, especially if it makes your computer run better. ■

BY DANA MONTEY

Lotus 1-2-3

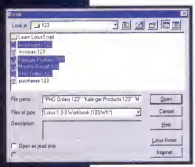
Open Sesame

You probably don't think much about it. You want to work on an existing file, so you click File, Open, and then you click the file you want to open. Well, you do have other options for opening files in 1-2-3.

You even have a choice in what you can open. Naturally, 1-2-3 can open files created in 1-2-3. These files will have an extension of .123, .12M, .WK4, .WK3, .WK1, or .WT4. You can also open dBASE files (DBF), HTML (Hypertext Markup Language) files (HTM or HTML), text files (TXT, PRN, or CSV), and files created in Excel (XLS, XLT, XLW), Paradox (DB) or Quattro Pro (WQ1, WB1, WB2). When opening these types of files, 1-2-3 attempts to transfer the data into appropriate rows and columns; however, formatting, such as fonts and colors, may be lost.

In a rush? Don't waste time opening files one at a time. Open them all at once. Bring up the Open window by clicking File, Open. Hold down the CTRL key and click each of the files you want to open. Then click Open. You can open as many as 32 files at a time as long as they are in the same folder.

Say you want to include data from another file in your current file. Why wait? Merge that data together while you open the file. From the Open dialog box, select the file with the data you want to import, then select the checkbox for Combine With Current Workbook. When the Open button becomes Combine, click it. Now specify how much data you want to import and whether to add, subtract, or replace current values. To enter a range, type the address of the first cell followed by two dots, then the last cell. Click OK. 1-2-3 deposits this new data in the currently open sheet starting with the current cell (outlined in black).



Open several files at once by holding the CTRL key and clicking the desired files.

You do not have to limit yourself to opening files just from your hard drive. Go crazy and open files in Lotus Notes or from the Internet. Just click the appropriate button from the Open dialog box. If you are opening a Notes file, you first need to know the Notes server and database where the file is kept. If you are opening a file from the Web, you must enter the URL (uniform resource locator) of a specific Web page in the Address field. If you are opening a file via FTP (File Transfer Protocol), you may need to contact your network administrator to help you set up access to those files.

Open Files Automatically

Maybe the drudgery of clicking File, then Open is getting to you. Avoid the work by having your files open automatically when you start 1-2-3. You can do this one of two ways.

First, you can open all your often-used files automatically if they are stored in one folder. Click File, User Setup, 1-2-3 Preferences, then the File Locations tab. In the field under Automatically Opened Files, enter the path to the folder with the files to be opened. Click OK when done. Do not bother typing in the name of a file; 1-2-3 will ignore it.

Give some thought to what folder you enter in this box. 1-2-3 attempts to open every file in that folder no matter what type of file it is. This means those files should be files 1-2-3 can open or you will get several error messages. You can always use the default folder (C:\Lotus\123\Auto) and move your files to this folder.

The second method involves editing the 1-2-3 icon's properties. Find your 1-2-3 icon on your Windows Desktop or in your Start menu and right-click over it. Select Properties from the menu. Click in the Target box and move the cursor to the end of the current text, which is the path to your 1-2-3 application. Press the Spacebar and type –W. Then, in quotation marks, enter the full path and name of the file to open. The Target should look something similar to: C:\LOTUS\123\PROGRAMS\123w.Exe -W "C:\MY DOCUMENTS\Myfile.123." With this method, 1-2-3 automatically opens only one file; however, you need to edit each icon you use to open 1-2-3.

If you work with the same spreadsheets everyday, especially those with links to data in other files, have 1-2-3 open those spreadsheet automatically and grab another cup of coffee while your files open and update. ■

BY TRACEY DISHMAN PATTERSON

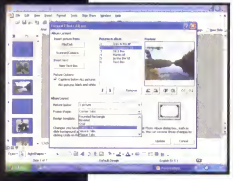
Microsoft PowerPoint 2002

Use Photo Albums

Office productivity packages with several versions under their belts invariably suffer from chronic feature bloat. But one new feature in PowerPoint 2002 actually feels like a response to real user needs. The Photo Album feature (which was available as a downloadable add-on for PowerPoint 2000) is a handy way to create the type of slideshow many PowerPoint fans have been laboriously building on their own for a long time.

Start An Album

To create a new photo album, choose Insert, Picture, New Photo Album. In the Photo Album dialog box, you'll create, format, and modify your albums. Note that photo albums are standalone files; creating and working with one won't affect presentations you have open.



The Photo Album feature provides a fast way to insert photos into a presentation and format them all with a few clicks.

To insert pictures from your hard drive, click the File/Disk button under Insert Picture From. (You also can insert files directly from a scanner or digital camera.) Navigate to the directory with your photos and click the file you want to insert (or click several in succession while holding down the SHIFT key) and click the Insert button.

The photos go into the album in the order in which you inserted them, but you can change the order by clicking the name of a photo and clicking the up or down arrows directly below the list of photos. The trusty Remove button is there to kick out any photos that fall out of favor.

You can do some rudimentary photo editing with the buttons under the preview window. The pair of buttons on the left lets you rotate photos 90 degrees in either direction, the center pair adjusts contrast, and the right pair handles brightness. Click the Create button to create your photo album.

Have It Your Way

To adjust your album's looks, choose Format, Photo Album. When it comes to formatting, choosing Fit To Slide in the Picture Layout option is the most restrictive. This option won't let you add captions to slides, and don't even think about putting an artistic touch on frames or album layouts. Choose a different option in the Picture Layout option and you can have a lot of fun formatting your photo album.

In the drop-down menus at the bottom of the dialog box, you put a single photo or group of photos on each slide, add several different types of frames, and add a title to each photo slide. Click Captions Below ALL Pictures to add witty comments to slides.

Add a little more meat to your photo presentation by inserting text boxes, either on their own slides or on the slides with the photos. To insert a standalone text slide (think of them as the title screens between segments of a documentary), click the New Text Box button in the Photo Album dialog box. PowerPoint drops the text box into the album's last position; use the up and down arrows to move it around.

The Picture Layout drop-down menu also lets you select various slide layouts that include title text boxes. Or, once you've created your photo album, you can add text boxes to slides as you would with any other PowerPoint presentation slide.

By now, you've noticed that the default background for photo album slides is roughly as exciting as the label on a box of generic brand cereal. To add a little more flair, select a Picture Layout other than Fit To Slide and then click the Browse button beside the Design Template line at the bottom of the dialog box. You can sift through all the templates available for normal PowerPoint presentations. Choose one and click Select.

Because your photo album behaves fundamentally like any other PowerPoint presentation, you can apply backgrounds, slide transitions, and other effects just as you would with all the normal slides you cut your PowerPoint teeth on.

To set up your photo album to quickly format groups of photos for display, choose Slide Show, Slide Transition. Pick the transition you want (Newsflash, Random Bars Vertical, etc). Under Advance Slide, click Automatically After and enter a time interval in seconds (3 is a good choice for self-running presentations). Click the Apply To All Slides button. To keep the show running until you stop it, choose Slide Show, Set Up Show and select the Loop Continuously Until 'ESC' checkbox. ■

BY TREVOR MEERS

The Print Shop 15 Deluxe

Brush Up & Refine Your Graphics

Print Shop offers a full-featured set of graphic-editing tools. In this article, we look at how to use two features new to version 15—brush support and gamma control.

There are two ways to select a graphic to modify. The first lets you select a graphic that has already been placed in a project. Open the project that contains the graphic you want to modify. Click the graphic to select it. Click Edit Photo, Brush Effects in the Object Toolbar (along the left side of the window).

The second way lets you modify a standalone graphic that hasn't been placed in a project. With a project open, click Art Gallery in the Object toolbar. Select the graphic you want to modify by clicking it. Click the Edit Graphic button (it looks like a camera) on the toolbar at the top of the Art Gallery window.

Get creative with Print Shop's Brush Effects, which let you paint your graphic to achieve a new look.

Edit Photo modifications are applicable only to bitmap graphics, or those composed of very fine dots. Brush Effects are unavailable for raster graphics, which are defined mathematically. You will know what type of graphic you have when you select it using one of the two ways above. The graphic is raster type if Brush Effects is grayed-out using the first method or the Edit Graphic button is grayed-out using the second method.

You will be taken to the Photo Workshop no matter which way you choose. Click the Brush Effects tab to use brushes or the Brightness & Focus tab to adjust gamma, among other settings. The pane to the right will contain a preview of the graphic.

Brush Effects

Select the graphic, open the Photo Workshop, and click the Brush Effects tab to prepare to modify the graphic using brushes.

Select a brush size and click the colored bar to bring up a palette of colors. Select a brush color from the palette or click More to define a custom color.

Click and drag the brush on the graphic in the preview pane to create the effect you want. Use zoom in for fine work; zoom out for larger effects.

Click Undo Last if you want to undo the most recent action. Click Undo All to go back to the graphic's original look. Note that clicking Undo All will undo effects created under all the tabs of the Photo Workshop.

Gamma Adjustment

Selections available under the Brightness & Focus tab are Brightness, Contrast, Blur/ Sharpen, Saturation, and Gamma. Behind the scenes, gamma is a complicated concept involving daunting terms such as "voltage response curve." Gamma correction in Print Shop, however, is simple in practice.

Fine-tuning gamma is important when you are dealing with a graphic that has a lot of midlevel tones, such as the myriad gradations of fine black-and-white photographs. Adjusting gamma creates an increase or decrease between these gradations.

It's important to adjust gamma if your graphic is going to appear online because Macintoshes and PCs use different gamma values. A graphic will appear flat and washed-out on a Mac display if it is tuned to look balanced on a PC. So make any graphic that is going to appear online look a little dark on your PC to split the difference between the Mac and PC.

Adjust the gamma level for a selected graphic by clicking and dragging the slider or clicking the light and dark boxes at either end of the line. Move to the right for lower contrast and brighter appearance or to the left for more contrast and darker appearance. You can Undo Last or Undo All in the same way as with Brush Effects.

Save

You have several options for saving your changes after using the Brush Effects or Gamma functions. Click Send Online to store the graphic at the Broderbund ExpressIt site. Click Save As to save the graphic in a variety of formats, including BMP (bit map), JPEG (Joint Photographic Export Group), GIF (Graphic Interchange File), or TIFF (Tagged Image File Format).

Print Shop 15's new graphic manipulation tools expand upon the application's already rich feature set. Simple fixes and effects are available for those who don't want to invest in a standalone paint program such as Adobe Photoshop. ■

BY TOM HANCOCK

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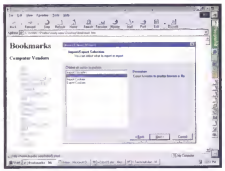
Quick Tips

Secrets For Succeeding In Common Tasks

Internet Explorer 6

You can export your list of Favorites in Internet Explorer 6, which means convert it to an HTML (Hypertext Markup Language) document you can import into another browser on a different computer. To do either of these, click the File menu and Import And Export, then follow the wizard's instructions. The exported HTML document itself is interesting. In it, IE separates your Favorites by category. You can open the document in any browser and click a Favorite, which will act as a hyperlink. You also can print the document for a handy reference when you're seeking a particular bookmark that's hard to find.



Export your Favorites in Internet Explorer 6 and you'll get an attractive HTML (Hypertext Markup Language) document you can print or import into another browser.

Windows 95/98/NT/2000/Me/XP

If you're using a word processing program, such as Microsoft's Word or WordPad, or a spreadsheet program, such as Microsoft's Excel, you can copy a portion of text to the Desktop. Use the mouse to highlight the portion of text you want to copy, right-click it, and select Copy. Then right-click in any open space on the Desktop and select Paste. This creates something called a Scrap. To use the text in the Scrap, either double-click the newly created Scrap icon or right-click it, select Copy, and then paste it into appropriate place.

Excel 2000/2002

There are two ways to change column width in Excel. Let's say you want to widen Column C. To do this manually, place the pointer on the line between the labels for Columns C and D. The pointer will change to a resize icon (a vertical line with intersecting left and right arrows). Click and drag the column to the desired width. A quicker way to change column width is to place the pointer on the line between Columns C and D. When you see the resize icon, double-click. This automatically resizes the column to the width of the longest line of text in the column.

Pocket PC 2002

If the default background on your Pocket PC's Today screen is a little too blue for your taste, add some color with a new background. You can use one of Pocket PC's optional Today screens by tapping Start, Settings, Today. To activate one of the other backgrounds, highlight the background from the list and tap OK. You can return to your original settings by repeating the process and selecting the Default background. If you want to download free backgrounds or create your own on your PC and sync them to your PDA, download Microsoft's free Theme Generator at http://www.microsoft.com/mobile/pocketpc/downloads/themegenerator.asp.

Theme Generator lets you add your own image to your Pocket PC's Today screen.

Case Lights

Some hobbyists, especially ones with transparent panels on their PCs, choose to add decorative lights to illuminate the hardware inside their systems. Neon and cold cathode case lights come in colors such as green, blue, and red, and cost about $10 to $25. Most case lights come completely assembled and connect to an unused power lead. However, if you have to solder your own power connector to your lamp's leads, make sure that the thickness of the connector's wire is the same size or larger than the light's wires. A thinner wire could overheat, become resistive, and damage the light.

Monitors

If your monitor displays images too brightly or too darkly, you might be tempted to change the brightness setting. Although this can help, changing the contrast setting often does a better job of correcting the problem. Locate the controls for adjusting your monitor (these are usually buttons located on the bottom or side of the bezel that encases the front of the monitor) and adjust the contrast setting until the image looks better. If your monitor has a set of two or three modes, try switching between modes. Modes typically change overall settings, including contrast; a text mode, for example, will darken images, and a graphics mode will brighten images.

Outlook Express 5/6

To make Outlook Express highlight messages from a certain person, click the Tools menu, Message Rules, and Mail. Under Select The Conditions For Your Rule, select the Where The From Line Contains People checkbox. Under Select The Actions For Your Rule, select the Highlight It With Color checkbox. Under Rule Description, click the Contains People link. Type the person's email address in the first field, click Add and OK. Under Rule Description, click the Color link and select a highlight color from the drop-down menu. Click OK. Type a name

for the rule in the Name Of The Rule Field and click OK.

CD-ROMs

Protect your data by labeling CD-ROMs with media-safe markers. If you buy CD- or DVD-ROMs at retail stores, you've probably noticed that many disc manufacturers offer CD-ROM-friendly markers. The claim isn't a myth: you might be jeopardizing your data with just a few strokes of your pen. Many permanent markers use alcohol that can damage your CD-ROM. The ink won't damage your CD-ROM as long as it stays on the nondata surface of the CD-ROM, but if it reaches the data layer, it can destroy information.

Power Switches

You may have a long list of high-quality components in your computer, but chances are that the on/off switch isn't on that list. The lowly power switch seems to be one of the components the PC's manufacturer added as an afterthought. It's usually a cheap part the manufacturer uses to help sell an inexpensive system with otherwise impressive specs. To keep the power switch from failing after a few months or weeks of normal use, use your power strip's on/off switch instead. It's more resilient, and it can save energy by completely shutting off your monitor.

Windows 95/98/NT/2000/Me/XP

If you'd like to identify the route your computer takes to access a particular Web site, you can use the Tracert utility. Network administrators and Webmasters use the utility for troubleshooting, but it can help anyone find the source of a problem with connecting to a Web site. While connected to the Internet, click Start, Programs, and Command Prompt. (WinXP users click Start, All Programs, Accessories, Command Prompt.) Type tracert followed by a single space and the URL (uniform resource locator) or the IP (Internet Protocol) address for the appropriate Web site. Press ENTER and the utility displays each "hop," or step, along the way.

Internet Explorer 5/6

When you click a link in Internet Explorer, the new page may sometimes load in a separate, smaller window. To change the default placement of this window, close IE if it is running. Launch IE and press ALT-Spacebar to open the System Menu. If the window is maximized, click Restore. The size and placement of the window shows where any secondary windows will load. Move the window to the desired position. If you want primary pages maximized, press ALT-Spacebar and click Maximize. Close IE to save the changes. Next time you launch IE, secondary windows should load in the correct position.

Palm OS 3.0 and later

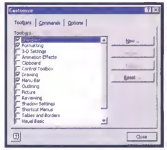
Palm OS sorts your applications into different categories. You can view all of your applications on a single page, or you can view a single category per page. Most of your programs are already in a category, but if you install a new application (or if you want to change the category of an application), you can choose in which category you want to file the application. Tap the drop-down menu icon next to the Graffiti writing area, then tap Category. The Category window displays your applications on the left and shows what category they belong to on the right. Click the category next to your application and select a new category.

PowerPoint 2000, 2002, X

Folks who use office programs often like to customize. If you've made numerous changes to your PowerPoint toolbars and now you'd like to remove those customizations or if you've inherited someone else's computer and want to change the toolbars, you're in luck: PowerPoint's Reset feature lets you do this. Select Customize from the Tools menu, click the Toolbars tab, click the toolbar you want to reset, and click the Reset button. A dialog box appears, asking if you're sure you want to reset the selected toolbar. Click OK.

Word 2000/2002

You can create your own custom toolbar in Microsoft Word. Click the Tools menu, Customize, the Toolbars tab, and New. Type a name in the Toolbar Name field and select Normal or Normal.dot from the Make Toolbar Available To drop-down menu. Click OK and then the Commands tab. Click a category from the Categories list and browse its available functions in the Commands list. To add a button to the toolbar, click



PowerPoint's Reset feature lets you remove any customizations that have been made to PowerPoint toolbars.

and drag the desired Command from the list to the blank toolbar (located next to the Customize dialog box). Continue adding more toolbar buttons and click Close when you are done.

Palm OS 2.0 and later

Palm OS (operating system) for PDAs (personal digital assistants) has two methods for entering information: the on-screen keyboard and Graffiti, which lets you write characters and numbers with your stylus. PDA manufacturers often include stickers you can attach to your PDA that show you how to write each letter, but you can toss the stickers and keep your PDA clean without losing that information. If you forget the which strokes make up a particular letter, place your stylus anywhere in the Graffiti writing area and drag the stylus toward the top of the screen. Graffiti Help opens and displays the correct strokes for every character. ■

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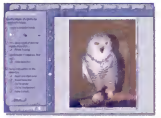

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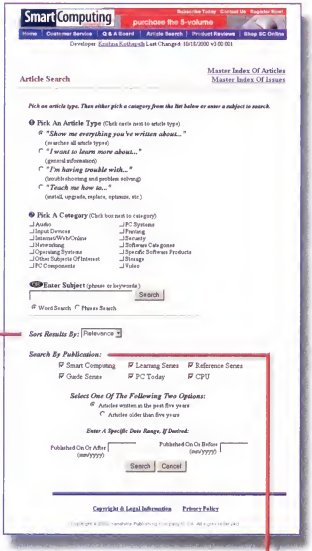

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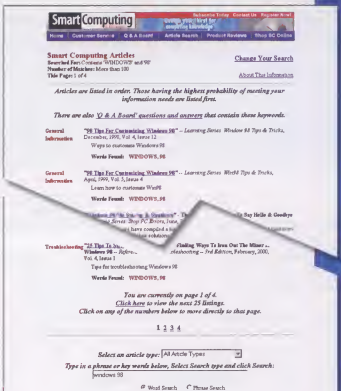
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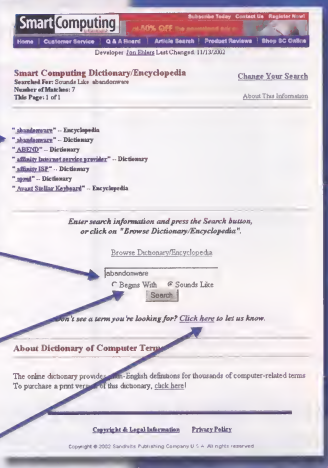
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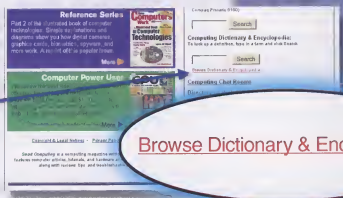

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THE ROAD NEVER TRAVELED.

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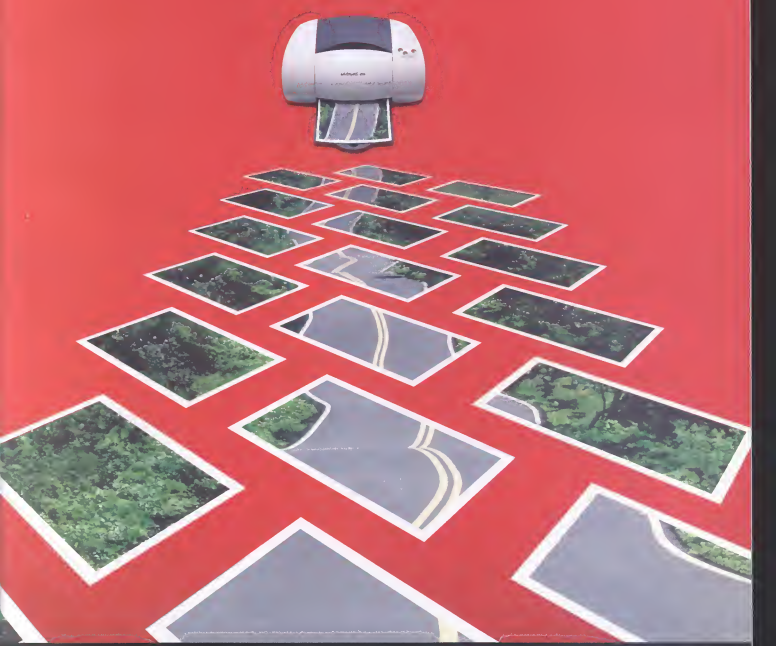

At twice the resolution of the nearest competitor, the Z65 photo printer doesn't just break the rules, it changes the game altogether. The Z65 offers 4800 dpi* (5.8 megapixels) of resolution, dual paper trays, plus Lexmark's legendary speed – all this for less than $200. Available from Best Buy, Circuit City, CompUSA, Dell, Office Depot and Staples. Visit us at www.lexmark.com/road10/ for more information about Lexmark products.

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Compiled by Chad Denton
Graphics & Design by Ned Day & Ginger Riley

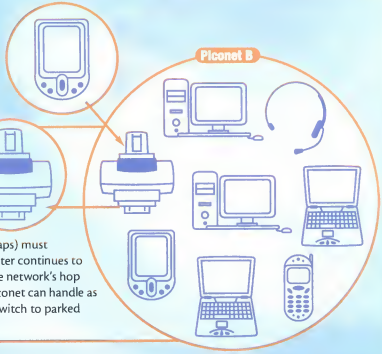
Bluetooth Unbound

Bluetooth is uniting a variety of devices using wireless technology. In addition to mobile phones and PDAs (personal digital assistants), Bluetooth is also turning up in keyboards, mice, projectors, printers, and digital cameras. Although Bluetooth's 10-meter range is smaller and its 1Mbps (megabits per second) transfer speeds are slower than existing wireless technologies, its battery-friendly design makes it easier to implement in small devices. The radio frequencies Bluetooth uses let you communicate with a cell phone in your briefcase or a PDA in your shirt pocket. This month, we'll examine what Bluetooth is, how it works, and what it can do for you.

Make A Connection

First things first: You have to create a connection between two or more devices before you can take advantage of Bluetooth. Bluetooth devices in standby mode wake up every 1.28 seconds and listen for activity on any of 32 frequencies.

To form a connection, a Bluetooth device sends out a Page signal on 16 different frequencies. Any device in standby mode that detects the signal responds. It generally takes about 0.64 seconds to establish a connection, but it can take as long as 2.56 seconds. The



Park It

A piconet can only accommodate eight active devices at any one time. That doesn't mean, however, that a piconet can't accommodate more devices with a bit of trickery. When a PDA wants to join a full piconet, another device (a printer perhaps) must switch from active to parked mode. While parked, the printer continues to listen to network traffic and remains synchronized with the network's hop sequence, but it doesn't actively send or receive data. A piconet can handle as many as 255 parked devices. When finished, the PDA can switch to parked mode, letting the printer become active once again.

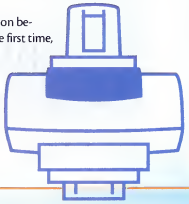
The Interference Dodge

In the United States, radio frequencies between 2.4GHz and 2.483GHz are unlicensed, meaning they are free to use, provided products meet certain FCC requirements. Bluetooth operates in this crowded, unlicensed 2.4GHz band along with various other wireless devices. Bluetooth uses FHSS (frequency hopping spread spectrum) to divide the 2.4GHz band into 79 1MHz channels. The master device sets the frequency hopping sequence and shares that sequence with all devices on the network.

All devices on the piconet tune to the same frequency (2.450GHz, for example). One device sends a packet of data across the network. Once it's received, all devices switch to the next frequency listed in the hop sequence (2.412, perhaps). Bluetooth can make 1,600 hops per second.

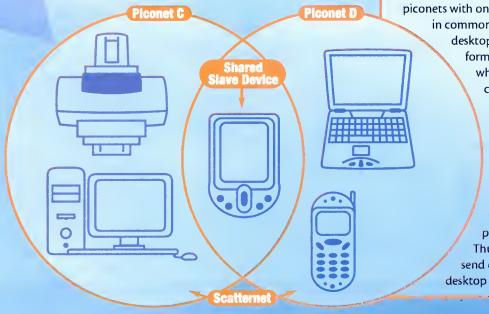
device that issued the Page command becomes the master of the newly created **piconet** (two or more connected Bluetooth devices).

When making a connection between two devices for the first time, the master must issue the Inquiry command to collect addresses from nearby Bluetooth devices. A subsequent Page command then establishes a connection.



Scatternet

A **scatternet** is two or more connected piconets with one or more slave devices in common. For instance, a desktop, PDA, and printer form an office piconet, while a notebook and a cell phone compose a mobile piconet. The PDA from the office piconet can join the mobile piconet, letting devices from the office piconet exchange data with devices on the mobile piconet via the PDA. Thus, the notebook can send digital images to the desktop via the PDA.

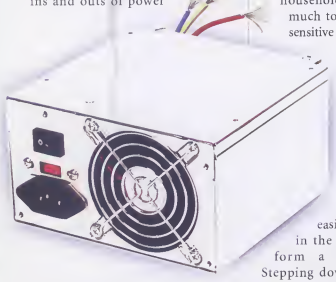


Power Supply Predicaments

Don't Underestimate The Value Of A Constant Current

TODAY'S COMPUTER CHIP MANUFACTURERS have succeeded in a remarkable sleight of hand: convincing the buying public that the measure of a computer's quality is dependent upon a glamorous chip. Yet savvy users understand that the real driving force behind a stable, powerful computer is a rugged power supply. Unfortunately, the low profile of the prosaic power supply has let many users choose a computer with an inadequate or low quality power supply, only to suffer a myriad of problems.

Fortunately, you don't need to be an electrical engineer to troubleshoot power supply problems or to replace a failing power supply. In this article, we'll help you make sense of all the components in a power supply and how they function. After explaining the ins and outs of power supplies, we'll also show you how to choose a replacement power supply and install it in your computer.



The Role Of The Power Supply

Power supplies fulfill a pretty simple role in today's computers, providing clean, uninterrupted power to the computer's components. On the surface, this seems a mundane task, but the truth is a bit more complicated. Your computer can't simply use the electricity that comes out of your wall outlet. Standard household electricity is AC (alternating current), and your computer uses DC (direct current) to power its internal devices. In addition, most household current is 110 volts, much too powerful for today's sensitive electronic components.

First, your power supply converts standard electricity operating at 60Hz (Hertz; the number of cycles per second, measuring waves or frequencies of electrical vibrations) into a higher frequency current. This makes it easier for the transformers in the power supply to perform a voltage step-down. Stepping down the voltage entails transforming the 110-volt current into a series of lower voltages. These voltages are usually 12V, 5V, and 3.3V, dispensed to your computer's components through a group of connectors called rails. In turn, power connectors are attached to these rails and then to the power interface of your motherboard, fans, and other components. Hard drives, fans, and optical drives typically use 12 volts, and your CPU and other electronic circuitry generally uses the 5V and 3.3V rails.

However, before your computer can use these stepped-down voltages, the power supply needs to convert them to DC, using rectifying diodes to perform the conversion. After the current has been rectified, or converted, it is run through a series of filters to clean up the current. This prevents an improper current from damaging the sensitive electronics in your computer.

Finally, your power supply has a series of capacitors that store electricity. This lets you power up your computer without using a mechanical switch. When you press your computer's power button, the capacitor discharges a 5.5-volt current, telling the power supply to turn on. This in turn provides power to your motherboard, and your computer begins the process of booting up.

If you need the ultimate in reliability, a redundant power supply may be worth the investment.

What To Look For In A Power Supply

Just as with any computer component, power supplies vary in quality and performance. Most of today's PCs use the ATX (Advanced Technology Extended) style power supply, with older models using the AT (Advanced Technology) style. If you're not sure what type of power supply your computer has, check for a label that indicates the type of supply. When you buy a new computer, you'll want to make sure that the power supply it ships with is adequate for your current, as well as future, needs. Computer manufacturers compete in a cutthroat industry, and power supplies are one area where they may be tempted to reduce their costs. If you take a few moments to ensure the power supply is suitable, you'll avoid unnecessary headaches down the road.

The first feature to look for in a quality power supply is adequate cooling. As the power supply's transformers step down the voltage, they create a large amount of heat that needs to be properly dissipated. Most ATX power supplies have at least one fan, and high performance power supplies often have two. Without adequate ventilation, your power supply can quickly overheat your computer, affecting performance and even damaging components.

Another important criterion is the load your power supply can carry. Power supply capacities are rated in watts, calculated by multiplying a product's voltage (V) by the amps (A) it draws. A common rating is around 250 watts, with high-end supplies topping out at more than 500 watts. Each rail on your power supply operates at a specific voltage (V) and at a specific amperage (A). For example, if the power supply provides 15 amps to the 12V rail, you would have 180 watts available for all the devices that operate on 12V current. One important thing to remember is that power supply manufacturers advertise the capacity of the power supply based on the sum of all the rails. If you exceed the capacity of a particular rail, your computer may experience difficulties.

Finally, a good power supply uses quality components. How can you tell? The best yardstick to use is price and reputation. A $20 power supply will probably be using inferior components compared to a power supply selling for $100. Companies, such as PC Power & Cooling (http://www.pcpowerandcooling.com), market power supplies that are quieter, cooler, and more durable than the wares of no-name manufacturers. If you are buying a new computer and can't choose a specific make, at least make sure that it can fulfill your power needs.

Keeping your power supply cool is the key to a healthy computer.

How Much Power Do I Need?

Determining how much power you need isn't difficult once you know that watts = voltage x amperage. First, list all the electronic components in your system, determine which voltages or rails they use and then add up their wattage. If the total wattage exceeds what your power supply can carry, you'll need to upgrade. To help demonstrate, we've included a sample chart with the wattage requirements.

Again, these are just a few of the components in a modern PC, and your components may have higher or lower requirements. When estimating your needs, leave yourself some room for growth. Use no more than 50% of your power supply's capacity. If a power supply is operating close to its peak output, it will generate more damaging heat and wear out at a faster rate.

Component	Wattage	Voltage
1GHZ Pentium III	35W	+5v
IDE Hard Drive	10W	+5v & +12V
AGP Video Card	35W	+3.3v
Motherboard	25W	+3.3v & +5v
256MB RAM	16W	+3.3v
CDROM Drive	20W	+5v & +12v

Total Wattage = 141

Potential Problems

If your power supply is functioning properly, it's easy to forget it's there. Yet when a power supply is overloaded or failing, problems quickly appear. Although a PC with a faulty power supply may exhibit a variety of symptoms, the most common are mysterious reboots of your OS (operating system) or a failing hardware device.

One of the more common symptoms you may experience is caused by overloading your power supply with a new component. After installing a second hard drive or CD-RW (CD rewritable), you attempt to reboot your computer only to fail. Remove the new drive, and the computer boots properly. Your first instinct was that the drive was defective, yet the true culprit was a lack of adequate power.

Another symptom of an overloaded or failing power supply is one or more components suffering from degraded performance. In this case, a component may function, but because it's not receiving enough wattage, its performance drops. This is common with many of today's high-powered graphics cards, such as the NVIDIA GeForce4 Ti. These cards draw power from your motherboard's AGP (Accelerated Graphics Port) slot that they reside in but also draw additional power directly from the power supply. If they're limited to drawing power from the AGP interface, they operate at a slower speed. Not what you're looking for if you've just spent $300 on a top-notch video card.

Overheating is another common problem with power supplies. There are two main factors that can cause your

power supply to overheat: overloading and inadequate cooling. When your power supply overheats, it becomes less efficient and can't supply enough power. It also may experience drops or surges on the rails, damaging your computer's components. In addition, the added heat can cause your processor to overheat, leading to the infamous BSOD (Blue Screen Of Death) that causes your OS to crash. The easiest way to avoid these problems is by choosing a reputable power supply, making sure you don't overload it, and keeping an eye on the power supply's cooling fans. If these fail, it's only a matter of time until the power supply starts experiencing trouble.

High capacity supplies like this one from Enermax use multiple fans for better cooling.

Help! My Power Supply Died

If your power supply has failed, and your computer is out of warranty, you can replace the power supply with a minimum of tools and experience. We have one note of caution: Don't try to repair a defective power supply. The capacitors we previously mentioned contain enough electricity to cause serious injury or even death. Avoid the temptation to toy with the innards of your old power supply.

The first step is to purchase a replacement from either your computer's vendor or a company, such as PC Power & Cooling. Next unplug your computer and open the case. Carefully trace each power cable and disconnect them from the devices they power, paying attention to the type of connector it uses. It's a good idea to take notes on each step as you proceed. After you've disconnected all of the cables, remove the screws that attach your power supply to the case.

Next, you'll need to fasten the new power supply where the old supply was mounted. After it's securely mounted, reconnect the power cables to the motherboard and other components. Each connector is "keyed" so it only fits one way, and you want to avoid forcing a connector. Take your time and make sure you don't miss a device. Also make sure that the power supply is configured to use 110V. This is usually set by a small red switch on the power supply.

Once you've made all the connections, close your computer's case and plug your computer into an outlet. You should be able to successfully start your computer. If your computer won't boot, check to see if you missed a component's power cable.

It's Electrifying

Unfortunately for the humble power supply, it never achieved the fame and glory that has been heaped on the CPU. Instead, it simply performs in the shadows, until it dies of old age or abuse. Now that you know what to expect from a power supply, you'll be able to choose and install a sound replacement. ■

BY CHRIS JACKSON

The Dell Dilemma

Today's computer manufacturers have standardized on the ATX format for computer power supply units. Or have they? Starting in September 1998, Dell began a manufacturing program that has created (and continues to create) problems for users seeking to replace or upgrade their Dell desktop computers. At first glance, both the power supplies and motherboards in the Dimension line of desktops look like normal ATX-style equipment. The power connectors are the familiar keyed connectors we've grown accustomed to, as are the 12V connectors used for fans and other devices.

Yet appearances are deceiving and dangerous to your hardware's health. For reasons known only to Dell, the company decided to make alterations to the wiring harness, as well as the motherboards they ship. If you examine closely the wiring that plugs into the connectors, you'll find that Dell has reversed several wires. If you're using a Dell brand (or Dell-supplied) power supply and motherboard, you shouldn't have any problem, as the Dell motherboards expect this wiring arrangement.

However, if you try to replace your Dell power supply with a non-Dell replacement, you may severely damage your motherboard because the replacement power supply would send the wrong currents to your system. The converse is also true: If you replace your Dell motherboard with a non-Dell approved motherboard, you'll probably end up with a damaged motherboard. In either case, you also risk damaging the power supply, and some users have even reported experiencing fires in their computers when using a non-Dell motherboard or power supply.

We don't know why Dell decided to use proprietary hardware when most computer manufacturers have embraced the ATX standard for motherboards and power supplies, but if you find you need to replace your power supply, be sure that you use either a Dell brand power supply or one that is compatible. PC Power & Cooling (http://www.pcpowerandcooling.com) make excellent replacement power supplies for approximately $90. ■

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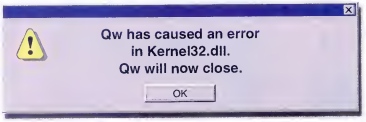
Examining Errors

Nearly all Windows programs rely on DLL (dynamic-link library) files, including Windows itself. These files hold lists of commands programs can perform and therefore turn up in a large percentage of error messages because they're referenced so often. This month, we looked at several DLL-related errors, along with a strange and annoying error related to an old version of Adobe Photoshop.



The Problem: When using Quicken Home and Business 2000 and attempting to update her stock portfolio online, a reader receives an error message and then Quicken crashes. The reader also experiences problems with Quicken 2000's Qagent application and its Update Utility, two other components of the software that access the Internet.

Error Messages: "Qw has caused an error in Kernel32.dll. Qw will now close."
"Qagent has caused an error in Mrtproc.dll. Qagent will now close."
"Quicken 2000 Update Utility. The update for Quicken 2000 was not completed."

Because these three error messages are somewhat related and occur in the same program, we'll tackle all of them together. The first message references Kernel32.dll, which is Windows' main DLL file and one that most other programs on the computer access frequently. Quicken is asking Kernel32.dll to perform a command that isn't on its prescribed list, or otherwise is going outside the boundaries the DLL file established. When this happens, Windows is designed to immediately shut down the program that caused the error to prevent it from affecting other running applications, including Windows itself.

Intuit, maker of Quicken, suggests starting Windows in Safe Mode, creating a new Quicken data file, and repeating the steps that led to the Kernel32.dll error using the newly created test file. If the error doesn't occur in Safe Mode, there's a chance that the original data file generating all of the errors is corrupt, and you'll need to check the Intuit technical support site (http://www.intuit.com/support) for instructions on salvaging data in the file.

Looking online, it seems many Quicken 2000 users have been able to make the error go away by uninstalling Quicken, disabling or uninstalling their antivirus software, then reinstalling Quicken before reinstalling or reactivating their antivirus software. We were unable to test this method to see if it works because we could not get Quicken 2000 to generate Kernel32.dll errors in the first place, but because Intuit also recommends uninstalling and reinstalling Quicken when certain Kernel32.dll errors occur, it couldn't hurt. Just be sure to back up any Quicken data files you have before uninstalling the software.

The next two errors are more closely related. Qagent is a utility that automatically checks for Quicken program updates on the Internet and downloads them in the background so the programs are available when you want to install them. The majority of Quicken users don't like this software because it causes errors like the one listed here and slows down Web browsing or access to the Internet when users don't want it to. The best solution is to disable the utility and download updates manually at http://www.quicken.com. To turn off Qagent open Quicken, expand the Edit menu, click Options, and click Internet Options. Now press ALT-SHIFT-4, and Quicken 2000 asks if you want to turn off the Quicken Background Download Manager (Qagent). Choose Yes and click OK in the Connections Options window. You must restart the computer to make the changes stick, and the error shouldn't pop up anymore because Qagent won't launch to generate the error.

If you have downloaded an update for Quicken, but it doesn't install successfully, you'll see the Quicken 2000 Update Utility error message listed above. According to Intuit, the only way around this error is to uninstall and reinstall Quicken, making certain you don't install the software to the root of the hard drive. For example, when selecting a folder to install the software, choose something such as C:\QUICKEN2000 instead of C: because C: is the root "folder" of the C: drive. We suggest you avoid installing Quicken to the root of any drive because that leads to all sorts of errors besides this one. Once you've reinstalled Quicken, you must visit the Quicken Web site, download the latest patch for the software, and apply it manually by double-clicking the downloaded file. ❙

The Problem: Every time a reader boots her computer, she gets an error message referencing a DLL. The reader can cancel the message and use her computer, but her keyboard's special keys don't work properly after doing so.

Error Message: "A required .DLL file, Eztext.dll, was not found."

Many IBM keyboards, including the Rapid Access Keyboard that ships with many IBM PCs, use this DLL file. If Windows can't find the DLL, most of the special keys on these keyboards, such as volume control buttons, fail to work. If you cancel the error, though, the computer should otherwise operate normally and the standard keys on your keyboard should work properly. Regardless, it happens each time the computer boots, and we know a few ways to fix the problem.

If you open your C: drive and see an Ibmtools folder, open it, and you should find five files with .DLL extensions, including Eztext.dll. If the files are there, you may be in luck. Many users have eliminated the DLL error message by copying all five files to their C:\WINDOWS\SYSTEM folder.

You may also have to put them in C:\WINDOWS\SYSTEM32 if the System32 folder exists on your PC. To copy each file, move the mouse pointer over a file's icon, hold down the right mouse button, drag the file to the System folder, and release the mouse button. When the context menu pops up, click Copy. Repeat this process for each DLL file; don't forget to copy them into the System32 folder, as well, if your Windows installation has that folder.

If the files aren't there, your drivers may be improperly installed or mising. If you don't have the keyboard's driver diskettes or CDs, download the latest driver files from the IBM Support Web site (http://www.pc.ibm.com/support) or at its driver download site (http://www1.ibm.com/support/all_download_drivers.html). The driver files we found were relatively large, so it may take several hours to download them using a dial-up connection.

If you use an IBM Aptiva equipped with a keyboard that requires the Eztext.dll and if you've just installed Windows 98, along with the keyboard drivers, there is a chance the "missing" DLL is installed on the computer, but Windows doesn't know where to find it. Aptiva user Don Schneider maintains an unofficial tech support site for Aptivas at http://members.aol.com/don5408/aptiva.html. The site has numerous tips and files, including a small patch that might help Windows find Eztext.dll. The file is buried in the site, but the direct link for the download is http://home.ptd.net/~don5408/apps/bmsubfix/bmsubfix.exe. You can read more about the patch to see if applies to you at http://home.ptd.net/~don5408/apps/bmsubfix/bmsubfix.txt. ❙

The Problem: Each time a reader boots her computer, an error referencing a DLL file appears.

Error Message: "Devldr16 has caused an error in Devcon32.dll. Devldr16 will now close. If you continue to experience problems, try restarting your computer."

Devldr16.exe is a program Creative Labs' sound cards use that runs in the background to provide sound card emulation for legacy DOS games. Many of Creative's 32-bit sound cards use the Devcon32.dll file, so this is definitely a sound card double whammy. Follow the manufacturer's instructions to uninstall and then reinstall the drivers for your sound card, making sure to use the latest version available at the manufacturer's Web site (http://www.soundblaster.com) instead of the installation CD that came with your sound card or computer. It's possible to disable Devdlr16.exe completely so it doesn't load at startup, but we don't recommend that option because it causes more problems with the sound card (especially in DOS) than the annoying error message at startup does. ❙

The Problem: A reader with Adobe Photoshop 4.0 installed on her computer sees an error message every time she attempts to use Photoshop to open a JPEG (Joint Photographic Experts Group) image.

Error Message: "Microsoft Outlook: Either there is no default mail client or the current mail client cannot fulfill the messaging request. Please run Microsoft Outlook and set it as the default mail client."

Many Photoshop 4.0 users have had this problem. Several applied the version 4.0.1 patch to fix the error, but Adobe no longer offers the patch at its Web site. We couldn't find a reliable Web site that has the download.

That leaves two options: You can live with the error, which only pops up the first time you open a particular image, or you can upgrade to a newer version of Adobe Photoshop. Adobe has trial versions at its site (http://www.adobe.com), but if you're using Photoshop 4.0, you may not have a new enough computer to use versions 6.x or 7.x. You can try to find version 5.0 on an auction site, such as eBay; versions greater than 4.0 don't generate this error. ❙

BY TRACY BAKER

Quick Fixes

Hewlett-Packard LaserJet 2500 color profiles

Some printer users like to tweak color management settings using ICC (International Color Consortium) profiles; these profiles help your printer understand the exact color levels your PC attempts to produce. If you're using Windows 98/Me, you may want to download these profiles for your 2500. To download this file, type the URL (uniform resource locator) below, type LaserJet 2500 in the Driver Downloads & Updates box, and press ENTER. Next to HP Color LaserJet 2500 Printer, click Drivers & Downloads, scroll through the lengthy list of OSes, and click the link for your OS. Look for the HP Color LaserJet 2500 ICC Color Profiles CMYK link and click Download. Double-click the file to install it. ◆

http://welcome.hp.com/country/us/en/software_drivers.htm

Iolo System Shield

This 672KB file will fix two errors that may occur when the program analyzes some FAT32 (file allocation table, 32-bit) hard drives or when it scans high-capacity or fragmented NTFS (NT file system) hard drives. To download the update for this program, type the URL below and on the left side of the screen, click Upgrades. Click the System Shield Upgrade Info link and read the on-screen instructions for downloading and installing the file. You'll need to click the Download The Updated System Shield Installation File Here link to begin the file transfer. ◆

http://www.iolo.com

McAfee Instant Updater

If you're using McAfee Instant Updater, you may want to download this 344KB patch, which adds support for Engine Hotfix in the U.S. and U.K. versions of Updater. To obtain the file, type the URL below; select McAfee Instant Updater from the Product drop-down menu and click English from the Language drop-down menu. Click the link for RUP2002a.exe and after the download finishes, double-click the file to install the patch. ◆

http://download.mcafee.com/updates/upgrade_patches.asp

Internet Explorer

Crackers are always attacking Microsoft products, and they've found more vulnerability with Internet Explorer. This weakness potentially lets a stranger access your computer and peruse files on your hard drive, so be sure to install this 2.5MB patch. To download the file, type the URL below, select Internet Explorer from the Product/Technology drop-down menu, and click Go. Under Sort Results By, select Date and click Go. Click the link for Q324929, which was added Dec. 6, 2002. From the upper-right portion of the screen, click Download. When the download is complete, double-click the patch to install it. ◆

http://www.microsoft.com/downloads

MapPoint and Streets & Trips (2002 & 2001 versions)

The digital road maps in these programs are great for planning trips to unfamiliar areas, but only if you keep them updated. This file revises your maps to include recent road construction activity, so you can avoid traffic snarls and bypass confusing detours. To download this update, type the URL below. From the Product/Technology drop-down menu, select MapPoint and click Go. From the Sort Results By drop-down menu, select Date and click Go. Scroll through the list until you find a link named MapPoint 2002 and Streets & Trips 2002 Construction update. Keep scrolling to find the link for the 2001 versions. Click the appropriate link and click Download. Once the download is complete, double-click the file to begin updating your maps. ◆

http://www.microsoft.com/downloads

Fix of the Month

Epson Stylus Photo 825 P.I.M. plug-in for Adobe Photoshop

If you have an Epson printer, you've probably heard of P.I.M. (Print Image Matching) technology that helps your digicam, PC, and printer work together to produce more accurate colors. If you use Photoshop to manipulate your photos, download this plug-in for the 825 that helps P.I.M. version 2 work correctly. To download this 2.2MB file, type the first URL below and click the P.I.M. II Plug-in (2.0) link, click past the Download Survey, and click Accept to accept the license agreement. Note that Epson offers this plug-in for a number of its printers; if you have a different model, type the second URL listed below, click Printers, and click your printer's number to see if the plug-in is listed. Double-click the downloaded file to install the patch.

http://support.epson.com/swdesc/contlink.php?pid=2

http://support.epson.com

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Need help with your hardware or software?
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Windows

Q: In your November 2002 issue, you covered the importance of backing up files from the hard drive. So, in Windows 98, I clicked the Start menu, then Programs, Accessories, System Tools, and Backup. However, once I clicked the Windows Backup utility, it gave me an error, stating, "A required .DLL file, SH31W32.DLL, was not found." The missing files are causing me nightmares. How can I rectify this?

A: Others must share your nightmare because Microsoft has a solution at its support site (http://www.support.microsoft.com). Apparently, the problem is caused by a not-quite-complete installation of the Backup utility. To fix the problem, you need to uninstall and then reinstall the Backup applet.

Click Start, point to Settings, and click Control Panel. When Control Panel opens, look for the Add/Remove Programs applet and start it. Double-click if you have this and other folders set to the Windows Classic format or simply click it if your folders and Desktop are set up to emulate a browser.

When Add/Remove Programs starts, select the Windows Setup tab. While in Add/Remove Programs, remember this: when you clear a checkbox, whether for a single item or a group of items, you'll uninstall them when you click OK. Likewise, placing a check mark beside an item or a group of them will install that item or the entire group.

The Backup utility is located under System Tools. Select that group and click Details. Clear the Backup checkbox, click OK, and click OK again. Restart your system.

Now go to Add/Remove Programs again (Start, Settings, Control Panel). Click the Windows Setup tab and select System Tools and Details one more time. This time, place a check mark in the box beside Backup (by clicking it) to indicate you wish to reinstall the application. Click OK twice and restart the system again.

Backup should be installed properly this time. Although Microsoft's instructions do not say you need to have your installation CD handy when you perform this reinstallation, experience tells us it's a good idea to keep it close, just in case.

Q: I had an older Pentium 133 computer with an upgraded 10GB hard drive running Windows 98. I recently replaced it with a more recent Pentium 366 running Win98 SE (Second Edition) on a 20GB drive. I took the old 10GB drive out of the older machine and installed it as a second drive in my newer computer. The newer computer's BIOS (Basic Input/Output System) recognized the older drive's presence, but when I start Win98 SE, it doesn't recognize the second drive. The drive doesn't even show up in My Computer. Is this because Win98 SE won't recognize a drive that has the older Win98 on it? Am I going to have to erase everything on the older drive to get it recognized? What can I do?

A: Neither the version of Windows on a drive nor file contents on a drive should make a second drive invisible to a different version of Windows that resides on a different drive. Usually problems of this nature are at the hardware or BIOS level: failed controllers, loose cables, incorrect jumper settings, and so on. Clearly that's not so in your case, or your BIOS wouldn't see the drive. You shouldn't normally have to erase your older drive to get it recognized.

Assuming the second drive is properly installed, we know of two reasons Win98 SE might fail to see a second drive. The second drive may have been formatted with NTFS (NT file system) or the other drive has a special partition management utility (called variously a large partition manager or a hard drive overlay), such as EZ-Drive or Disk Manager, installed. It's highly unlikely you have NTFS on the old drive because Win98 never offered NTFS as an option. We say that because computers of the age of a Pentium 133 (about a decade old now) had BIOSes that couldn't recognize drives that

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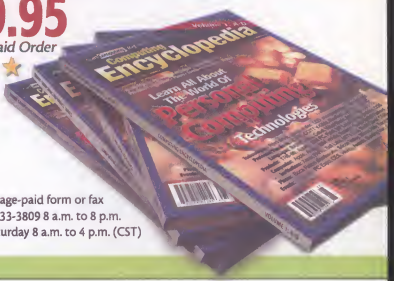

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are more than 2GB (in some cases 8GB) without the help of such overlay software. So, we suspect you may have an overlay there. If so, there are ways to make that older drive's contents accessible.

You could install the older drive as the first drive. That way, the overlay would activate itself at boot/startup time and do its job of making the partition visible. You could then erase (or reformat) the drive and install Win98 SE. Or you could hunt for an old overlay utility floppy diskette that came with the old 10GB drive; if you find it, that utility may let you remove the overlay. If you know which brand of overlay utility is on your drive, you can contact the overlay's maker for help removing it. You may see names, such as Disk Manager, EZ-Drive, Microhouse, DiskBlast, on the diskette, or you may see the brand name of your drive manufacturer (Quantum, Western Digital, etc.). If you have an overlay on the drive and don't want to move it into the boot/first drive's position, you may have to remove the overlay even to erase the drive's contents.

DOS

Q: On page 67 of Neil Randall's article, "The Weakest Link," in the December 2002 issue of *Smart Computing*, he says you should delete lines from the Config.sys, Autoexec.bat, Win.ini, and System.ini files to make the system operate more efficiently. He says that you should make backup copies of these files in case editing them causes the computer to crash.

I make backup copies but instead of deleting the lines, I typed **REM** or **;** (a semicolon) at the beginning of the line to make the computer ignore the line. If the computer malfunctions without the line, I simply restart in Safe Mode and edit the REM or the semicolon from the beginning of the line. I have only done this a few times and had no problem. My question is this: Is there any reason that I shouldn't use REM or a semicolon?

A: First, let's sort out when you'd use REM or a semicolon to comment out or "remark" a line of code. Use a semicolon, followed by a space, at the beginning of a line in the Windows configuration files, Win.ini and System.ini, as well as in the DOS configuration file, Config.sys, to have the code that follows ignored. REM (or lowercase, rem), followed by a space, only works in the DOS batch language used in the other main DOS configuration file, Autoexec.bat. A semicolon will not work here.

Commenting (or remarking) your code so that you and, in some instances, other programmers, can follow your logic at a later time is a good idea. Commenting out lines you wish to edit and working with copies of those lines also makes it easier to restore the old version if your newest bright idea doesn't pan out. However, unless there's some compelling reason not to clean up afterward, you'd eventually remove the older code once you have the program completed.

Utilities

Q: In the November 2002 issue, in "The Usual Suspect" article (page 56), you mention the importance of running Disk Defragmenter on a routine basis. At one time, we could incorporate this into the Autoexec.bat file and have it run during startup. This also used to be part of Scheduled Tasks Microsoft built in with previous versions of Windows. As Windows moved into the Win2000 environment and beyond, it has become increasingly difficult to set this up through Scheduled Tasks. Would you be able to give me the steps that would let me add the Windows' Disk Defragmenter to Scheduled Tasks, preferably with no user interaction and minimal interruption to the user? I work in an office environment and need to limit the amount of problems to the end user.

A: Alas, you can't get there from here. The version of Disk Defragmenter in Windows 2000 is based upon Executive Software's Diskeeper but doesn't have all of its features (http://www.execsoft.com, then click Home or Corporate). The limited version in Win2000, according to Microsoft, can defragment only local volumes, can defragment only one volume at a time, cannot defragment one volume while scanning another, cannot be scheduled, and can run only one MMC (Microsoft Management Console) snap-in at a time. To do what you've asked for, including running without user intervention, would require the full version of either Diskeeper or some other disk defragmenter. There is also a shareware application, StartDefrag, which acts as an add-on to Win2000 to let you schedule defragging, at http://kevin.gearhart.com/startdefrag. (It's free for nonbusiness use; otherwise it's $79 to $145, depending on how widespread your company locations are.)

Q: Every week, my antivirus program catches several incoming email viruses. Because they can't be repaired, I send the messages to quarantine. Can I safely I delete them or should I keep them in quarantine indefinitely? If I delete them, do they go to some dark corner of my hard drive where they are really no danger to my computer?

A: Infected files in quarantine are no danger to your computer (unless someone goes into your quarantine folder and deliberately activates or releases

them). Read the documentation for your antivirus program to see where it corrals viruses and how to delete them. If you delete the viruses from quarantine, they may go temporarily to the Recycle Bin and eventually completely disappear, or they may immediately be totally deleted.

If the quarantined file is a new email message or attachment, we can't see much reason for you to keep it. Go ahead and delete it. However, you know you won't be able to see the email itself. We don't like keeping infected files around, even in quarantine. On the other hand, sometimes data files or program files that were already in your system can get viral infections. This could have happened if you had introduced a virus by a route other than email or if the virus arrived before you had updated your antivirus definitions, in which case it would have been activated and could have infected other files.

Your antivirus program may have discovered and quarantined these secondary infected files during a later virus scan of your system. In those cases, before deleting the data or program files, you'd best note their identities; a quarantined program file can no longer perform its intended function, and you may have to replace it. For example, we recently scanned a system and found and quarantined an infected utility program file that was part of the Easy CD Creator CD duplicating utility. Discovering its purpose before deleting it from quarantine was important; we then knew that the Easy CD Creator software was damaged beyond repair, and we would have to reinstall it.

Computer Hardware

Q: I recently heard that crackers are able to access people's wireless home or office networks by driving around and tapping into them with wireless-equipped notebook computers. Have you heard anything like that, or is it a rumor the cable and phone companies spread?

A: You're referring to the common 802.11b wireless networks, also called Wi-Fi, and there's some truth to what you've heard. In fact, there's even a term for the practice to which you refer: wardriving. 802.11b wireless networks are easy to detect with an 802.11b-equipped notebook. Because of the notoriously poor security surrounding 802.11b networks, it's possible to easily gain access to many such networks. Wardriving is the act of looking for available wireless access points within a designated area (such as a city or neighborhood). Users typically drive around with an 802.11b-equipped notebook PC using special software to find wireless networks. The word is related to wardialing, an older term referring to the process of calling telephone numbers within a specific block of numbers looking for numbers with a modem attached.

Nearly all Wi-Fi-certified products ship with basic encryption capabilities (40-bit key WEP [Wired Equivalent Privacy]). If encryption and/or other security features are inactive, malicious or curious folks within range can often connect into the network just as easily as the folks the network was intended to serve. One recent experiment revealed that about half of the Wi-Fi networks detected in Manhattan, Silicon Valley, and Jersey City didn't have WEP turned on.

We doubt that the cable and phone companies have much motive to spread such rumors: Local wireless networks don't compete with the telcos and cable ISPs (Internet service providers). In fact, such Wi-Fi networks are a convenient way for folks to share broadband connections among several computers and even incentives to purchase broadband connections these companies offer. For more than you probably wanted to know about security issues when running a small wireless network, you can read the Wireless Access White Paper at http://aspin.asu.edu/ISACA/whitepapers/mar2002.html.

Internet

Q: I cannot work with Hewlett-Packard because I turned off cookies, and I don't know how to reactivate them. I was receiving so much spam that I overreacted by turning off the cookies. Please tell me what I must do to get back into Hewlett-Packard's bulletins, etc.

A: How you set the cookie controls depends a lot on which version of Internet Explorer you have (assuming that's the browser you're using). If you're using Netscape Navigator, that's a different procedure and it's different again for Opera, and the version of each will make it different again. We don't have enough space here to detail all of them, so we're going to try something a little different.

First, however, let's talk about persistent HTTP (Hypertext Transfer Protocol) cookies, sometimes known as magic cookies or just plain cookies. They were developed with an innocuous purpose in mind: to aid online commerce and make being a user of online commerce services easier. The original idea was to make it so that if you visited a shopping site and had to leave before you checked out with your purchases (or if you visited the site often), the site would recognize you when you returned and you wouldn't have to re-enter your personal data each time. In the case of an interrupted session (to answer the phone, for instance), the

idea was to make it easier for you to pick up where you left off without having to reshop for items already in your cart. Cookies are helpful in these situations.

Alas, like so many innocent ideas, this one went awry when some people figured out nasty things to do with cookies that might compromise your privacy, such as placing them on your hard drive to get a sense of your surfing habits.

When cookies first began to appear from Web sites, the browsers of the day accepted them and users didn't have much choice. Today, depending on your browser, you'll have several choices of how to deal with cookies: accept all cookies, receive warnings when a cookie arrives and decide whether to accept it, or refuse all cookies. But that's not all. More recent releases of Internet Explorer, for example, give you these choices, as well as letting you selectively accept or reject cookies based upon which Web site sends or receives them.

Information on the way a browser deals with cookies is always in its Help file. So, click Help and search for cookies to see how to enable cookies with your particular browser.

So we can give you some guidance, however, we're going to assume you have Internet Explorer and walk you through enabling cookies, using IE 6.0.

Click Tools and Internet Options. On the General tab of the Internet Options dialog box, look to the Temporary Internet Files section. One button lets you Delete Cookies stored on your hard drive.

To give yourself more control over cookies, however, click the dialog box's Privacy tab. On the Privacy page, you have two options. Immediately visible is a slider, set to Medium by default, with a range from High (block all cookies) to Low (accept all cookies). The permutations of choices can be confusing, however, so there's a simpler way to set your preferences. Ironically, it's under the Advanced button, found half-way down the page.

The Advanced Privacy Settings dialog box lets you determine whether to accept, deny, or get a prompt asking if you want to accept first and/or third-party cookies (those originating from or being sent back to the Web site you're currently visiting or those that come from or get sent back to a different site). You can also choose to accept or deny session cookies (cookies that are for the immediate Internet session only and are not stored on your hard drive).

If you've used the Advanced Privacy Settings dialog box, click OK and click OK again on the main Internet Options dialog box. Otherwise, if you simply used the slider, click OK once to apply the changes. The effect is immediate and you don't need to restart your system.

Q: On several occasions, I've received an email saying a message I had sent failed to reach a certain email address. On each occasion, the message referred to the same email address: res1d9jj@verison.net. As far as I know, I've never had this address on my computer and have never sent anything to it. I've browsed through my email address book looking for that unknown address but can't find it. How can I find out where this address is stored in my computer, short of deleting all my email address and retyping? I have Win98 and use Outlook Express for email.

A: Chances are that you don't have that address in your address book (or on your computer at all) and you've never sent any messages to it. It's likely someone else who has both your address and that unknown one in their computer has a virus in their computer and that virus is sending email messages to the unknown address and forging your address as the From address.

However, it's pretty easy to find out for certain if that email address is anywhere in your computer by using Find. Click Start, Find, and Files Or Folders. In the Find All Files dialog box, type *.* in the Named field. (This tells the search to look at every file, regardless of its name.) From the Look In drop-down menu, select something like All Local Drives or My Computer. If you have only one hard drive, you can set it to C:. In the Containing Text field, type **res1d9jj@verison.net** and click the Find Now button. Because Find examines the contents of every file on your system, this search could take quite some time. But if that address is anywhere in your computer, this search should tell you not only that the file is there, but also where it is located, what file and folder it's in. In WinMe/2000/XP, the Find tool is called Search, and the details are slightly different, but you can perform text searches.

If you want to limit the search for that unknown email address to your email system, rather than your entire computer, try this: Open Outlook Express and click the Edit menu and then click Find. Next select Message and use the Browse button to make sure the Look In drop-down menu specifies that the search will cover all Local Folders. First try typing the unknown address into the From box and click Find Now. If that doesn't find it, try typing the suspect address into the To box or the Message box and again click Find.

Finally, you can go to a reverse email lookup service, such as freeality.com (http://www.freeality.com/finde.htm) or About.com's Family Internet (http://familyinternet.about.com/cs/emailfinders), and see if it can tell you to whom that unknown email address belongs.

Frequently Asked Questions

Answers to users' most common questions about
CDs & DVDs

FAQ: What's the difference between CDs and DVDs?

The CD debuted in 1982 when Sony released the first mass-produced music CD (an album of Claudio Arrau playing Frederic Chopin piano waltzes). Since then the CD-ROM has become the standard medium for distributing software. The DVD, first introduced in 1996, has the same physical dimensions as the CD (both are 1.2mm thick and 120mm in diameter). CDs and DVDs also both have a continuous spiral track that consists of lands (bumps that reflect light) and pits (holes that don't reflect light), which represent the 0s and 1s that make up binary data. A laser beam scans the grooves to read the data; because no machinery physically touches the disc when reading it, CDs and DVDs last much longer than their analog counterparts: audiotapes and videocassettes. In other ways, however, CDs and DVDs are quite different. The rings, or grooves, on a CD are 1.6 microns wide, and those on a DVD are 0.74 microns wide (one micron is the approximate width of a human hair); the result is that a DVD can store about seven times more data than a CD.

FAQ: What are the various CD formats?

There are more than a dozen CD formats, but the most popular include CD-R (CD-recordable), CD-RW (CD-rewriteable), CD-DA (CD Digital Audio, the format that standard music CDs use), Photo CD (for organizing digital photos), and Video CD (for storing low- to medium-quality video). Most CD drives (whether they be CD-ROM drives or CD-RW drives) can read any of these CD formats. Most standalone CD players play CD-DAs and many newer models play CDs that contain MP3 audio files.

FAQ: What are the various DVD formats?

There are many existing DVD formats, as well as a few that are currently in development. You're probably most accustomed to DVD-Video, the format used to store full-length movies, TV shows, and other multimedia entertainment using the MPEG-2 (Moving Picture Experts Group-2) compression standard. DVD-Audio is a relative newcomer that offers an improvement in quality and capacity over standard audio CDs. DVD-Video and DVD-Audio play on DVD-ROM drives and standalone DVD players. DVD-RAM is a cartridge format that uses one or both sides of the disc and has capacities ranging from 2.6GB to 9.4GB. DVD-RAM typically lets you write and erase data using Windows Explorer, so it effectively acts like an extra hard drive. You can write to a DVD-RAM up to 100,000 times, but it will only work in a DVD-RAM drive.

The most popular formats for PC users fall into two categories: The first includes DVD+R (DVD plus recordable) and DVD+RW (DVD plus rewriteable); the second category includes DVD-R (DVD-recordable) and DVD-RW (DVD-rewriteable). You can save any type of data to these discs; if you save MPEG-2 video to DVD+R/RW or DVD-R/RW, you can play the results on DVD-ROM drives and most standalone DVD players. You can't, however, record DVD+R/RWs on a DVD-R/RW drive, and vice versa. A typical DVD+R/RW or DVD-R/RW holds 4.7GB worth of data. You can write data to a DVD+RW or DVD-RW up to 1,000 times. Check out the DVD Forum Web site (http://www.dvdforum.org) for more information about the DVD-R/RW/RAM formats or the DVD+RW Alliance (http://www.dvdrw.com) for details about the DVD+R/RW formats.

FAQ: What does the X mean in terms of speed?

A number followed by an X designates the speed at which a CD or DVD drive can accomplish a certain task, such as reading, writing, or rewriting data to a disc. For CDs, the X indicates a speed of 150KBps (kilobytes per second), so a CD drive that reads data at 48X actually reads at 7,200KBps. For DVDs, the X indicates 1,350KBps, so a drive that reads DVDs at 4X actually reads at 5,400KBps.

One Tricky PC

I contacted you a few months ago about a defective Gateway PC. You helped me get a new hard drive for the system, but right after installing the new drive, the system began shutting off at random intervals. The drive seems to work fine, but if the computer idles for an hour or so, it shuts down for no reason. I took the computer in for service, and the technician replaced the power supply. I brought the computer home, started it, and found that the display wasn't working properly. I called tech support for help, and during the call, the tech managed to completely erase my hard drive, for which he apologized. I've spent the last week reinstalling the programs I lost and retyping the data from hard copies, but I have lost countless hours of work time and also information about dozens of business contacts. I don't know what to do about this company, but I'm so angry I'm not sure I can speak to them in a civil manner again.

Carol Pehrson
Forest City, Iowa

After we received Carol's second letter in late November 2002, we immediately contacted Ashley Wood, a manager of corporate communications at Gateway. Wood replied a few days later, saying she'd look into the problem. On Dec. 10, we received another message from Carol. As compensation for her ordeal, Gateway sent Carol a new PC; she called a few weeks later and said that the new computer was working fine.

I recently updated the virus definitions for my copy of Norton Internet Security. After the update completed, I was unable to use my Internet connection, meaning there was no way for me to access Symantec's online tech support. I called my ISP [Internet service provider] twice, and after a lot of trial and error, my connection worked again until I activated my computer's firewall. I experimented and finally concluded that the program doesn't work in tandem with my firewall. I tried to email Symantec's technical support, but I couldn't send the message without an account number that proves I bought the program online. I can't find the number in my records. Can you help?

Peter Schludermann
Hillsboro, Ore.

On Nov. 18, 2002, we emailed Phil Weiler, senior public relations manager at Symantec, explaining Peter's technical support problem. Weiler responded immediately and said he would look into the problem. A Symantec representative helped Peter fix his Internet problem, but Peter had trouble connecting to the Internet again the next week. Peter called the Symantec technical support line again and a representative identified the problem—the LiveUpdate process had corrupted his firewall rules. The representative helped him reset the rules, and Peter's Internet service began to work properly.

I bought a Samtack DVD-ROM drive from Best Buy, and when it began to malfunction, I took it back to the store. The customer service person I spoke to told me I'd need to contact the manufacturer to get a replacement drive. Per Samtack's instructions, I sent the defective drive back via U.S. mail and received a delivery confirmation. It's been almost four weeks, and I haven't heard anything from Samtack. I really need this drive for my work. Can you help get me get the drive I paid for?

Gregg Heilman
Allentown, Pa.

We emailed Karen Wong, a Samtack spokesperson, on Nov. 19, 2002. She replied on the same day and said that the drive would be shipped soon. A few days later, Gregg received a brand-new, fully functional drive.

ACTION EDITOR

Are you having trouble finding a product or getting adequate service from a manufacturer? If so, we want to help solve your problem. Send us a description of the product you're seeking or the problem you're having with customer service. In billing disputes, include relevant information (such as account numbers or screen names for online services) and photocopies of checks. Include your phone number in case we need to contact you.

Letters may be edited for length and clarity; volume prohibits individual replies.

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Sounding Board

Each month, we give voices in and around the computing world a chance to sound off on topics that matter to everyday users.

"The average consumer will see extremely little to no impact as a result of the almost finalization of the U.S. government's antitrust case against Microsoft. Most notably, this is largely because the changes required are minor—the most visible being an extra configuration screen allowing more selection of so-called middleware programs—and Microsoft has already been in compliance with most of the settlement even before the final ruling."

—David Smith, vice president of Software Infrastructure Research at Gartner

"The decision should lead to additional choices for consumers. Since Microsoft can't prevent others from offering rival software on Windows, consumers should see different products. But we won't see a significant difference in Windows or the marketplace. The judge refused to order more stringent relief, such as requiring a stripped-down Windows, so Microsoft likely will continue to dominate these markets for the foreseeable future."

—Hillard M. Sterling, partner, Much Shelist law firm

Q: In what was seen as something of a victory for Microsoft, a federal judge recently approved a much-criticized settlement of the Microsoft antitrust case and rejected harsher penalties that had been proposed by nine states. What will the settlement of this case mean to the average consumer?

"Microsoft lost every legal battle, but they won the war. In court, they were embarrassed. While inventive, Microsoft's business decisions were found to be unethical and occasionally illegal. The decree limits only the most egregious illegal acts, doing little to limit the merely unethical. Consumers will notice the loss only in comparison to what might have been. Few large firms want to work with Microsoft anymore; thus, fewer jointly developed products. Compared with the past, beware of that creeping feeling of less innovation in PC software."

—Shane Greenstein, professor of Technology Business at the Kellogg Graduate School of Management

"The outcome of this settlement is that Microsoft must provide developers with the APIs to "middleware" programs (Web browsers, email clients, instant messagers, media players, etc.) that integrate with the Windows operating system. This will allow other companies to create competing middleware software programs, thus giving consumers the freedom to substitute competing middleware software on Microsoft's operating systems."

—Mike Rosile, vice president of the Venice Area Computer Users Group

"Microsoft's strategy of delay ultimately worked to its advantage. Rather than settle the case in May 1998 or after extended settlement discussions before Judge Richard Posner, Microsoft chose to fight on. In the end, they were the beneficiaries of two events they didn't influence and couldn't have predicted: 1) Bush was elected in 2000 and appointed an antitrust chief that simply wanted to get rid of the case at any cost, and 2) Judge Thomas Penfield Jackson foolishly talked to the press and caused his removal from the case. These two events, more than any other, enabled Microsoft to win the case (so far). The losers are consumers who want alternatives and lower prices. Today, I have more choices in lawnmowers than I do in word processors, spreadsheets, browsers, presentation graphics, and desktop databases. The consumer has not been served by Judge Kollar-Kotelly's decision."

—Ken Wasch, president of the Software & Information Industry Association

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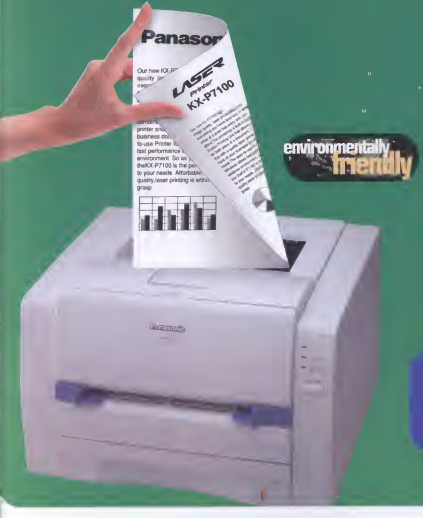

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